

General Psychology

Other Books
by John Edward Bentley

PROBLEM CHILDREN

SUPERIOR CHILDREN

OUTLINE OF PHILOSOPHY

General Psychology

PRINCIPLES AND PRACTICE

BY

JOHN EDWARD BENTLEY

PROFESSOR OF PSYCHOLOGY,

THE AMERICAN UNIVERSITY, WASHINGTON, D. C.

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TO
ELIZABETH CLARKE BENTLEY

Preface

To the books in general psychology there is no end and will be no end, since psychology grows with every passing day. This book had its origin when the classes of nurses at The Sibley Memorial Hospital were committed to my instruction at The American University. It was a new experience for me to face a class of students, every one of whom had entered nurses' training. To give them psychological literature was my immediate challenge. The initial days made me ponder: should a special course in psychology be written—a psychology for nurses? Then the thought: why a separate and special treatment for nurses? Is not psychology in its basic elements an undifferentiated content? Is it not the same for all—nurses, teachers, physicians, business men, social workers—in its groundwork and foundation? Time was when general psychology was presented for teachers; now it is written for life. The changed viewpoint indicates the basic human nature of man with his variable expressions.

This text is written in full appreciation of the task and service being rendered by nurses and physicians alike. It is aimed to give a groundwork for the understanding of human life in its broadest foundations. The plan aims to be historical, psychophysiological, applied. It presupposes that the mind is a product of the body. To this end physiology is fundamental to psychology. Without it human psychology could not exist. Therefore, the nurse who has had instruction and training in physiology should see the scope of psychological development with relative ease. If, however, the subject should appear difficult, and sometimes obscure, it should be remembered that it is hard and obscure, because human life is just that: never easy, mostly complex, often baffling, and always variable.

Because psychological foundations are necessarily a solidarity, differentiated only by the interpretations of individual minds giving individual modes of statement, this book may be used by anyone irrespective of his field of interest, by the general student bent on seeking a psychological foundation for his knowledge of human nature; hence, its title is unspecialized.

The introductory chapter of the book sketches briefly (1) how psychology grew into its modern scientific form, and (2) the modern purposes and aims which define its present scientific function. The book is divided into four parts: *the organic basis of psychology, the activity of the human senses, the means whereby learning is effected, and the problems of personality adjustment*. Part One, setting forth the physiological foundation of psychology, deals with the sensory, neural, and motor systems which form the basis of psychological science since the somatic function is fundamental to human life. This material the nurse, soon or late, knows with reasonable thoroughness or should do so. It is discussed in these pages to show how psychological life develops therefrom, by the common stimulations and motivation from whence proceed the basic responses of everyday life. The nurse in her public health training will therefore associate this discussion with her studies in anatomy and physiology, adding thereto a knowledge of human behavior.

Part Two introduces the problem of sensing and attempts to show how knowledge is gained by the external senses operating in conjunction with basic physiology, how movement is effected by the muscle receptors, and how feelings are fundamentally generated within the deep tissues of the body. In this section, and specifically in the case of visual and hearing experiences, the sense discussion is carried to the interpretative responses, known as perceptions. But the true unfolding of this aspect of psychological reaction is reserved for Part Three. There the matter of perceptual responses, giving the basis for remembering and recalling, is dealt with more fully. This third part thereupon serves as an explanation of learning in its broadest aspects and is summed up in the chapter bearing the name Learning.

Since personality, or whatever name is given that intriguing subject, is significantly attached to individuals in both health and sickness, four chapters are devoted to the general topic (Part Four). This part attempts to bring together in a relatively short survey the goal of human striving, and the quest for the adjusted, integrated individual. Throughout, by citing some irritating disorders, brief pages are given to show how the individual falls short of normality. Such discussions are not meant to take the place of a treatise in

psychopathology; they are really illustrations pointing the way to further readings and discussions.

Part Five makes useful reference to psychology applied to nursing. The chapter on Clinical Psychology aims to make psychology practicable. It shows the initial use of profile instruments and general psychological diagnosis procedures, citing numerous well-proved tests for the fundamental psychological field. The chapter on Psychoanalysis is presented to give foundation to this psychotherapy and should be considered as such, since it does not discuss many modern interpretations in recent literature. The student with psychosomatic interests cannot ignore this descriptive "depth" psychology. The closing chapter is a brief indication of the applications of psychology to some problems of public health designed to show psychology at work thereon.

Before each chapter introductory paragraphs are inserted to inform the reader what is in the pages that follow. This page offers a brief outline of the contents of the chapter and is written for the purpose of clarity and guidance. A selected list of readings is placed after each chapter, and these should be consulted zealously and read wherever possible.

JOHN EDWARD BENTLEY

May 1, 1947
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General Psychology

1

What Is Psychology?

HISTORY

"Psychology has a long past, but only a short history," wrote Herman Ebbinghaus, one of the founders of scientific psychology. This statement is weighted with meaning, for psychology has made a long journey in achieving its modern formulations. In the earliest times, when men first began to realize they possessed a mind as well as a body, psychology appeared in dim form. The story of psychology is therefore coextensive with human culture, growing with every increment of knowledge, and contributing widely to human progress. Men were psychologists long before there was an organized psychology, and today our choice is not whether we shall or shall not study psychology, but whether we shall study it intelligently and constructively.

Psychology's Ancestry

The first attempt to treat psychology scientifically was made by Aristotle in his book entitled *De Anima*, which, in its broad usage, means concerning life. This designation has made psychology the study or science of human living. The Greek title of Aristotle's treatise is *Peri psyche*, and the word *psyche* from which the name psychology is derived originally meant life or life-energy. Plato interpreted *psyche* as soul, and under his influence early Alexandrian learning adopted the usage, scholars of the early Church appropriated it, and psychology became the science of the soul.

In medieval times scholastic psychology sought to prove that the human soul has various earthly functions to fulfil, but the scholastics maintained it was a supernatural essence. The great Schoolmen from Anselm to Duns Scotus were ever engaged in the troublesome controversy regarding the primacy of the intellect and the will.

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Scholastic nominalism, representing the scientific insight of the Middle Ages, raised problems concerning the character of consciousness which today are still unsolved. The flowering of modern science beginning in the late fifteenth century produced great figures such as Leonardo da Vinci in the fifteenth, Copernicus in the sixteenth, and Galileo in the seventeenth century. In the seventeenth century appeared the famous philosophies of Hobbes, Descartes, and Spinoza.

Hobbes invented an unrelenting materialism which took the form of physiological psychology. He maintained that all thought was derived from experience and that all consciousness was generated by bodies in motion.

Descartes, whose theories dominated psychology until the rise of the modern scientific era, adopted the ecclesiastic notion of the soul as the central tenet of his thinking. He divided the world into matter and thought, declaring that psychic phenomena were linked to the body mechanistically. His presentation of the dualism or separateness of the body and soul created many difficulties which his successors sought to settle.

Spinoza, a conspicuous devotee of rationalism, proposed his system of parallelistic monism which declared that mind and body, or the mental and physical, were two aspects of the basic reality which run parallel.

In the closing years of the seventeenth century a landmark was erected in the development of psychology. John Locke, an English physician-philosopher, wrote a memorable treatise called **An Essay Concerning Human Understanding** (1690), and analyzed elements of cognition by assuming two sources of knowledge, namely sensation and reflection. According to Locke the mind at birth is a blank tablet and everything that ever appears in the mind must come through the senses (sensation) or be produced by reflection upon sense perceptions.

The eighteenth century witnessed the Enlightenment in France, England, and Germany, a movement which glorified knowledge, the sciences and arts, civilization and progress, race and achievements. Its empiricisms and rationalisms stimulated independent inquiries which developed into wider views of the world. The Enlightenment proposed to solve the problems of life affecting the institutions of state, religion, and morality. A revolution in psychological thinking

was occurring. In the sphere of mind the English associationists proposed that psychology abandon speculations and confine itself to empirical knowledge. They maintained that all knowledge is derived from sense experience, as did John Locke, and that pure reason contributes little or nothing. Thereupon the associationists set themselves the task of investigating the problems of consciousness on the basis of sense-data alone.

The immediate successors of the great German philosopher, Immanuel Kant, revived and supported the metaphysical consciousness, a theory basically opposed to the empiricism of the English schools, but knowledge was at the parting of the ways.

The biological awakening in the nineteenth century, fostered by Herbert Spencer and Charles Darwin in England, and Johannes Müller in Germany, laid the groundwork for a natural science of psychology. The dominant trend in psychology shifted from description and speculation concerning consciousness to the study of man's actions, and this, in recent years, has developed into the psychology of man's behavior, and in one form or another made psychology a study of human nature.

Evolutionism Influences the Natural Sciences. In the latter half of the eighteenth century and the first half of the nineteenth century evolutionism was producing a new method of studying the world. The natural sciences were in the making. Origins occupied the thought-stage. The world was in political and revolutionary flux. Social institutions were seething with repeated attempts for reform and progressive adjustment. Laplace had developed the nebular hypothesis in astronomy. Lyell was formulating the basic concepts of modern geology. Darwin published the *Origin of Species* (1859), and Alfred Russell Wallace set forth his evolutionary views in *Contributions to the Theory of Natural Selection* (1870). Thomas Huxley in England and Ernst Haeckel in Germany disseminated the new theories of evolution, and Francis Galton and Wilhelm Wundt brought the evolutionary outlook into early scientific psychology.

Physiology Contributes to Psychology. The classical physiologists of the first half of the nineteenth century, E. H. Weber, Johannes Müller, Purkinje, and their coworkers, were keenly interested in the psychological aspects of the sensory functions of man.

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At this time physiology was not an independent science and scientific psychology was not yet born, but both physiology and psychology were drawn close together. Müller investigated the physiology of the senses and their implications for psychology, and Helmholtz, the renowned physicist, opened the way for systematic experimental psychological study by objective laboratory instrumentation.

Scientific Psychology. With the progress of sense-physiology in Germany, reenforced by the tide of evolutionary doctrines in England, the time was ripe for the invention of scientific psychology. Wilhelm Wundt, in the last quarter of the nineteenth century, molded the scientific inquiries that were remaking physiology into a new psychology. Wundt brought experimental sense-physiology and the genetic method of Darwin, Galton, and their contemporaries into synthesis, and became the champion of early scientific psychology. Psychology was now rooted deeply in scientific soil, its data investigated by approved physiological methods in laboratory procedures.

Summary. Thus, psychology began in the dim past of man's history. Aristotle paved the way for the study of human nature by stressing the importance of the physical side of life. From him psychology received its earliest systematization. The *Novum Organum* of Francis Bacon furthered the Aristotelean method of induction and proposed the method of experimental science as the means for acquiring a knowledge of life. Hobbes, Hume, and Locke declared that ideas are not inborn but a product of sense activity. Kant and his followers offered the coordinates of perception, volition, intellect, and reasoning, as the stepping-stones of mind. But it required a science of physiology to provide the undisputed foundation for objective studies in psychology. Studies of the nervous system, involving the action of the spinal nerves, the transmission of nerve impulses, the function of the sensory and motor areas of the cortex, have shown a vital relationship between physiology and psychology. Hence, it may be said with a good deal of satisfaction that psychology, like most of our fundamental sciences, was born in the atmosphere of philosophy and received its modern foundation within the scope of physiological inquiry. Its earliest systematization came with Aristotle, its scientific formulation with Wundt.

THE FIELD OF PSYCHOLOGY

Psychology and Human Nature. The modern function of psychology is to investigate human behavior, to study the response of the individual to his environment, to discover and to record the measurable aspects of human conduct by scientific means, in order to understand life and control it by intelligent activity. Its special province is to study the manifestations of human life that seem to lie beyond mere physiological facts. These manifestations are commonly referred to as human nature, human behavior. Accordingly, psychology is interested in the behavior of the organism as a whole rather than physiological segments. It recognizes human activities as coordinated behavior units.

Adjustment. To understand human nature the facts of behavior must be penetrated, thereby psychology attempts to elucidate the interrelations of cause and effect. The relation of cause and effect is of special concern to psychology, as it is to all the natural sciences, and is expressed as adjustment, which means there is effected an adaptation between the organism and the environment through proper stimulation and adequate reaction or response. More generally this relationship may be expressed as the coordination of the human organism and individual experience. Adjustment presumes that a well-balanced nervous system functions in the interests of the health of body and mind. A strong nervous system gives foundation to adequate thought, feelings, action, endurance, courage, and every other form of human stability. The nervous system is the organic medium through which integration takes place, and thereby mental coordination is effected. When harmony of the many-sided self is achieved, when our accomplishments are welded into a working pattern of understanding and meaning, and a working efficiency is attained, then adjustment follows. Learning, human stability, and normal personality are products of such processes.

Building its data on basic physiological reactions and conforming to biological methods of approach, psychology claims to be a natural science. When it investigates processes declared to be mental, psychology can claim to be a mental science. When it applies its findings to human society as a group of interacting individuals, psychology becomes an important contributory social science.

METHODS OF STUDYING HUMAN NATURE

Man's life is one long endless expression of responses, some of which are native and unlearned, and some acquired and learned.

The unlearned responses are the simple behaviors which are common to the individual at birth, and persist in our everyday living unobserved and unnoticed. They are the reflex-instinctive impulses that are the groundwork of simple activity operating as the springs of man's nature. They are the perpetuation of the basic life-stock in us, a continuation of human nature that flows on throughout the human race, and are represented by our simple natural feelings, our native intelligence, our basic urges or drives unconditioned by life's experiences. They are the raw material on which we build, constituting our native self, our hereditary potencies that must be organized for the growth of human life.

Learned responses, unlike the unlearned behaviors, consist of all human activities which in the course of life have been acquired. They are the active perceptions which give us understanding and various meanings of life. They are the conditioned feelings and emotions whereby behavior takes on likes and dislikes, its pleasures and its annoyances, the memories, and thinking, which specify our degree of individual accomplishment and social growth. All of life is learning, and learning never ends.

The Purpose or Aim of Psychology. Psychology's purpose among the sciences is to describe, explain, and relate the facts of human nature. It must describe through the study of every kind of behavior every actual response; it must explain each response and uncover the facts on which psychological activity depends; and it must relate in some systematic way all the activities involved in their relations one to another. This psychological achievement means that the specific aim of psychology is to discover the facts of human nature by empirical methods, then it may be able to predict and control behavior in all its forms, which is its ultimate task. These specific and ultimate aims represent the goal of all psychological inquiry.

Methods of Psychology. The threefold purpose or aim of psychology, mentioned in the previous paragraph, carries with it four

fundamental functions which indicate how psychology seeks to accomplish its task. These psychological functions, like those of all the natural sciences, are: (1) observing and analyzing human responses; (2) gathering facts from as many human sources as possible; (3) using wherever possible experimental and quantitative methods; and (4) constructing adequate theories for organizing gathered data. To meet this demand there are two groups of methods used in the determination of psychological data known as objective and subjective means of inquiry.

THE OBJECTIVE METHOD. The objective method in psychology consists in the effort to observe phenomena under conditions systematically varied and controlled, called an experiment, which is observation on the scientific plane. Laboratory methods yield facts which are impossible by less organized procedures. They demand precise observation, adequate classification, accurate recording, and verification of what has been discovered. By observation facts are noted and collected. When such facts are ascertained they must be classified and recorded for the purpose of grouping, averaging, and providing statistical statements of the facts in terms of time, amount, and quality of response. These facts represent empirical evidence resting on trial and experiment and verified by reexamination, by gathering additional facts, or by the confirmation of discoveries based on previous inquiries. When the facts are verified uniformity of results offers the scientific evidence of conclusive data.

Casual observation of human nature is not enough because it tends to be inaccurate and uncertain. It is a common-sense psychology subject to folly and fantasy. Laboratory training in observation is necessary for the accumulation of accurate psychological knowledge. This kind of training includes the knowledge and uses of instruments, ability to control conditions so that distracting influences may be eliminated. The use of instruments, apparatus, and laboratory practices are important in making proper psychological observation. Thereupon experimental methods provide a record of facts and constitute observed objective data in quantitative or measurable terms which are subject to statistical formulation and verification. By such means wishful thinking, anticipation of results, preconceived conclusions, prejudices, errors, and hasty and complete judgments are avoided. Accordingly, objective psychology conforms to the demands

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of natural science, and asserts that only phenomena existing in space and time as quantitative and qualitative criteria can be regarded as reliable.

THE SUBJECTIVE METHOD. The subjective method in psychology is represented by self-observation or introspection. This method was very prominent in the early days of scientific psychology but is little favored today in the United States.

Introspections are descriptions of immediate experience known as consciousness, or conscious activity. Hence, introspection is a special descriptive method of observation which views the activities of consciousness as structures or patterns of sensitivities and affectivities, technically referred to as awareness. In psychological usage awareness represents the mental experience of an individual which corresponds to concrete objects as perceived through the medium of his own bodily sensations. Awareness has certain attributes or dimensions known as: (1) **quality**, which is the name given to an experience, a fundamental dimension of experience, such as the naming of a specific sensation; (2) **intensity**, or the magnitude attributed to a phenomenon; (3) **extensity**, or the spatial characteristic of an experience; and (4) **duration**, or the propensity of the experience indicating the time element of the event.

A CLASSIFICATION OF PSYCHOLOGY AND ITS FIELDS

Modern psychology in its academic and practical usages consists of **human psychology** in both its normal and abnormal forms, **applied psychology**, **social psychology**, and **animal or comparative psychology**.

Human Psychology. Ordinarily human psychology considers the individual in terms of infancy, childhood, adolescence, adulthood, senescence, and the varying human behaviors or responses particularized in man's life. The differentiated forms of human psychology are as follows.

(1) **GENERAL PSYCHOLOGY**, the study of the principles that govern normal behavior, with some consideration for all the interests of human psychology.

(2) **EXPERIMENTAL PSYCHOLOGY**, the scientific concomitant of general psychology, which investigates the reaction, behavior, or ac-

tivity of organisms and their mental phenomena by experimental methods mostly in laboratory situations.

(3) **DIFFERENTIAL PSYCHOLOGY**, concerned with the measurement of differences in individuals, compares individuals by means of testing. This form of human psychology is used in determining the fundamental characters in age, sex, groups, races.

(4) **PHYSIOLOGICAL PSYCHOLOGY** stresses the study of the nervous system, sense organs, and muscles of the body and their contiguous parts in their relation to mental activity or behavior. It is closely related to general psychology and in many respects is coextensive with it.

(5) **GENETIC PSYCHOLOGY** traces the origin and development of animal and human behavior in terms of the evolutionary principles of life.

(6) **CHILD PSYCHOLOGY** is especially interested in the original nature and learning abilities of the individual. These six groups give a comprehensive view of human psychology which should be understood by all students of human nature. The phases of human mental disabilities are grouped into another body of literature and called abnormal psychology.

Abnormal Psychology. Abnormal psychology is more and more becoming a division of psychology in its own right. Its purpose is to investigate and treat the individual whose conduct is classified as atypical, deviating considerably from the norm of everyday behavior. It has grown into psychiatry, a special branch of medicine dealing with diseased minds, such as the neurotic, the feeble-minded, and the "insane."

Applied Psychology. The applications of psychology to industry, business (especially salesmanship and advertising), education, law, politics, and public health, have carried the name of applied psychology or psychotechnology. It seeks to apply the principles of psychology, or create new principles, to the practical affairs of living.

Social Psychology. Branching out from the individual to the group, psychology becomes a social psychology interested in collective behavior. In this aspect psychology's main concern is with social patterns, social behavior expressed as imitation, suggestion, social attitudes, social conflict, as they appear in group living and in communal organization.

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Animal Psychology. Animal or comparative psychology investigates the behavior and reactions of animals, comparing them for the purpose of evaluating the simplest responses in the discovery and support of factual psychological principles. Many highly organized laboratory experiments have been conducted for this purpose, therefore animal psychology bears a close relation to general psychology and experimental psychology.

This enumeration of the broader fields of psychology may be reduced to three major divisions which will clarify psychology in its wide usages and values. These divisions are: (1) **pure psychology**, which includes general psychology with its experimental methods of inquiry searching for facts and principles, without immediate regard for the practical usefulness of its findings; (2) **psychotechnics**, or applied psychology, stressing possible applications arising out of discovered principles; (3) **social psychology**, emphasizing the behavior of individuals in intragroup relations, and institutional forms in collective reactions.

On the basis of this recognition psychological science may hope to: (1) **describe** every kind of mental activity; (2) **explain** each activity and the factors on which it depends; (3) **relate** activities one to another in a systematic manner, and, ultimately, (4) **predict and control** behavior.

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PART ONE

The Organic Basis of Human Psychology

The three chapters in Part One present aspects of the human organism fundamental to the study of psychology, specifying their form and indicating their parts in psychological life. The human body is a highly complicated mechanism. The student should know both its construction and its function as intimately as a mechanic knows an automobile. When this knowledge has been acquired, then it is necessary to know the forces that make it go and the general results that occur as a consequence of these actions. The forces that make the organism go are discussed as the determinants of psychological activity—stimulation and motivation. The general results of this activity are the major kinds of response—reflex behavior, perceptual reaction, emotional response, thinking skills, and habits. This knowledge represents the groundwork of human psychology.

ORIENTATION

Three fundamental activities form the foundation of our conscious actions:

- I. **Receptors.** Energies received from the environment.
- II. **Adjustors.** Energies as impulses are modified within the body.
- III. **Effectors.** Modified impulses are carried into conduct.

I. **Receptors or sense organs consist of:**

- A. **Exteroceptors** or external sense organs receive energies which give the experience of seeing, hearing, tasting, smelling, touching, temperature.
- B. **Proprioceptors** or the motor senses operate to give the

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experience of movement, strain, relaxation, position, balance.

C. Interoceptors or the organic senses provide the feelings of hunger, thirst, and other body sensations.

II. Adjustment represents a favorable relation of the organism to its environment. The nervous system is the means whereby stimulations and responses are related, connected, coordinated, modified and adjusted.

A. The Neuron is the unit of response, and consists of :

1. **Cell body**, which contains the nucleus.
2. **Axone**, which carries impulses away from the cell body to the next neuron.
3. **Dendrites**, which convey excitation to and from other cells.

B. The major activities of the neural adjustment mechanism are:

1. **Excitation**, irritability, sensitivity, indicating a capability for receiving stimuli.
2. **Conductivity**, or the passing of neural impulses from one neuron to another.
3. **Reenforcement**, or the facilitating of neural action.
4. **Inhibition**, or the suppression of neural action.

C. Three kinds of neurons are important for psychology:

1. **Sensory or afferent neurons** conducting impulses from receptors to their central terminals.
2. **Associative or connecting neurons** relating the brain centers, and the brain and cord centers.
3. **Motor neurons** discharging impulses from brain to muscles.

THE GENERAL NERVOUS SYSTEM

A. Autonomic nervous system consists of nerve fibers and cells called:

1. **Parasympathetic division** or the **cranio-sacral** fibers, promotes quiescence.

2. **Sympathetic division or the thoraco-lumbar fibers, promotes excitement, emergency reactions, as in fear, anger.**

B. Peripheral nervous system consists of spinal and cranial nerves.

C. Central nervous system containing the spinal cord, brain stem and cerebellum, and the cerebral hemispheres.

1. **Spinal cord is the lower levels of response for reflex action, coordination of the lower forms of behavior, and distribution of impulses from brain to muscles.**
2. **Brain stem and cerebellum, the intermediate levels of response. The brain stem consists of the medulla oblongata which connects the cerebellum with the cord, functioning to establish reflex connections, and regulate reflex impulses; the thalamus relays sensory impulses and some motor impulses.**
3. **Cerebrum, the higher levels of neural integration and adjustment. The cerebral cortex governs sensory, associative, and motor fibers, and is involved in all complicated skills and higher learning. It is actuated by (1) projection fibers which connect the sense organs with the cortex; association fibers connecting the sensory and motor areas of the brain; commissural fibers join the brain hemispheres in their corresponding regions.**

III. Effectors, the motor mechanism, are of two kinds: muscles, glands.

A. Muscle effectors are (a) striped and (b) unstriped.

1. **Somatic effectors, important in learning motor skills, are the striped, skeletal, voluntary muscles, innervated from fibers within the cerebrospinal region.**
2. **Visceral effectors, important in the affective side of human life, are the unstriped, smooth, involuntary muscles, innervated by glandular secretions, and the autonomic nervous system.**

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B. Glands as effectors are :

- 1. Duct glands which pour their secretions through cavities or ducts.**
- 2. Ductless glands (endocrines), contributing to the emotions, produce hormones which pass into the circulatory system. Thyroid, Adrenals, Pituitary, Thymus, Gonads and their psychological functions.**

2

The Human Organism: The Physiological Foundation of Psychology

The structure of the body which provides the basis of psychological reaction consists of three important groups of physiological processes, namely: receptors, adjustors, and effectors. On these three groups of processes human nature bases its expression, and foundation is given to the psychology of human life. The **receptors**, or sense organs, represent specialized cells for receiving different kinds of stimuli. The **adjustors** are part of the nervous system. They consist of complex neural structures connecting the stimulus and the response, and act as the mechanism of adjustment. The **effectors** are the muscle and gland cells which respond to the message received through the receptors and coordinated by the adjustors.

RECEPTORS

The Sensory Mechanism. Human behavior is essentially an active process which consists of the response of the organism to stimulation proceeding from the external world, engaging the integrated action of the sense organs (receptors) and the organs of response (effectors), with their associated mechanism. Man lives in a world of multiple stimulations, set in varied situations, which affect the organism through its sense organs or means of sensing. Gradually these stimulations are made specific, refined, and by a process of selection are used to build levels or degrees of skills, attitudes, and knowledge.

Three Groups of Receptors. Since human life demands specialized responses three groups of receptors have been adopted by psychology from the biological sciences, and recognized as part of the reaction mechanism. These groups are named: (1) exteroceptors, (2) proprioceptors, and (3) interoceptors.

THE EXTEROCEPTORS, or organs of "special sense," known as the external senses, consist of the eye, the ear, skin, nose, mouth and tongue. Actually the receptors are anatomic parts of these physical structures. The retina of the eye is sensitive to light waves and produces vision. The cochlea of the ear is sensitive to vibrations and produces hearing. The deeper portions of the skin are sensitive to pressure, heat, cold, and produce touch and related sensations. The nasal membrane is sensitive to chemicals, gases and other odor-producing substances, and produces the sense of smell. The "buds" of the membrane of the mouth and tongue are sensitive to chemicals in solution and produce taste.

THE PROPRIOCEPTORS, or motor senses, are organs for noting movement located in the muscles, tendons, tendon sheaths, joints, in the semicircular canals, and the vestibule of the ear. These receptors are sensitive to the movements of the body or its parts and give kinesthetic, static, and equilibric sensations.

THE INTEROCEPTORS, or organic senses, are sense organs which receive stimuli from within the body, in deep tissues, and in the linings of the alimentary canal. The interoceptors give rise to organic sensations, such as hunger and thirst, visceral and abdominal sensitivities, such as pain, and the common feelings associated with the internal organs.

Classification of Receptors. The receptors have been variously classified for behavior and reaction situations. The following is a tentative listing, with a citation of the nature and range of their stimuli, the mechanism involved, and the sensations produced.

The Receptors and Their Stimuli

<i>Sense</i>	<i>Mechanism</i>	<i>Nature and Range of Stimuli</i>	<i>Sensation</i>
I. Exteroceptive (External Senses)			
1. Sight	Retina of eye	Mechanical, vibratory	Vision or visual
2. Hearing	Cochlea of ear	Mechanical, vibratory	Auditory
3. Touch, tickle, pressure	Skin and deeper portions of body	Mechanical, contact, pressure	Tactual
4. Cold, cool	Skin, mucous linings of mouth and nose	Mechanical, temperature highly variable; for covered portions of body below 30° C.	Tactual
5. Warmth, hot	Skin, mucous linings of mouth and nose	Mechanical, temperature highly variable; for covered portions above 30° C.	Tactual
6. Pain	Widely distributed throughout the body	Mechanical, destruction of tissue	Doloral, painful
7. Taste	Tongue, soft palate, uvula, etc.	Chemical, liquids	Gustation or gustatory
8. Smell	Nasal membrane	Chemical, gaseous	Olfaction or olfactory
II. Proprioceptive (Movement or Motor Senses)			
9. Movement, strain, relaxation	Muscles, tendons, joints, etc.	Mechanical, strain or pressure on muscles and tendons	Kinesthetic
10. Position, balance	Semicircular canals, utricle, saccule	Mechanical, movement of liquid in organic parts	Static, equilibric
III. Interoceptive (Organic Senses)			
11. Hunger	Walls of stomach	Mechanical, contraction of muscles of the stomach	Organic
12. Thirst	Membranes of mouth and throat	Mechanical, dryness of tongue, soft palate, mucous membrane of cheeks and throat	Organic
13. Nausea	Stomach, duodenum, etc.	Varied stimuli	Organic

Other so-called senses: color sense, vertigo, genital, fatigue, hair sense.

Other introspective senses: respiration, suffocation, circulation, heart fluttering, sex, bladder distention, elimination, and visceral pain.

Little is known of the receptors and stimuli for these unclassified senses.

NEURAL ADJUSTMENT

The Structure and Function of the Nervous System. Receptors, or sense organs, convey the impulses they receive to the connectors or adjustors within the brain processes. In the brain and nervous system impulses are coordinated, modified, adjusted, and expressed in the human ability to act, feel, and think. Objects in the external world, making contact with the receptors by the process of stimulation, engage the physiological action of the nervous system which functions as an adjustment mechanism through which expressions take their mental form.

The nervous system is the connecting medium for all stimuli and their responses. It is a very complicated, complex, and active mechanism, made up of billions of cells called neurons, bundles of fibers integrated in groups and distributed throughout the body.

The major activities of the nervous system are concerned with the excitation, coordination, reenforcement, and inhibition of neural impulses. The following listing will indicate the extent of nervous activity and show its importance for psychological response:

1. **Excitability:** All living matter is characterized by irritability and sensitivity. The neural units (neurons) are highly sensitive and therefore superbly susceptible to stimulation.
2. **Coordination:** Many stimulated nerve centers act together, forming a unit of function. They converge so that one reaction is produced from many stimuli.
3. **Reenforcement:** Simultaneous stimuli tend to produce and increase the efficiency of neural response and thus facilitate the activity.
4. **Inhibition:** Not all nervous impulses persist even when they are required to do so, hence inhibition indicates the suppression of a response.
5. **Reciprocal innervation:** A stimulus may call for one kind of response in one set of muscular activity and another kind of response in other muscles. Innervation is thereupon said to be reciprocal.

It should be noted that all habits, all learning, depend on the adequate modification of the nervous system in which the patterns are adjusted in their varied activities.

The Neuron: The Structural Unit of the Nervous System. The human nervous system, with its billions of cells, charged by chemical and metabolic factors produces physiological processes which modify function. These changes are essential to human nature with its behaviors and learning, since they modify and coordinate the processes upon which mental life ultimately depends. When impulses are re-

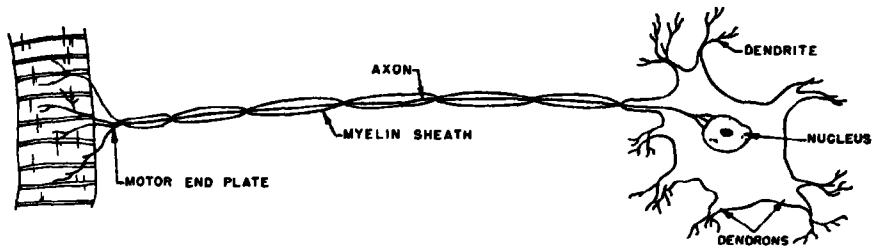


FIG. 1. Diagram of a neuron.

ceived in these nerve structures they are transmitted to contiguous cells by synaptic conduction, which by continued activity forms habits or patterns of behavior. In this way learning is basically organized into skills and knowledge. The average human being possesses billions of neurons, and this fact may account for the ascendancy of man above the lower animals.

The neuron consists of three fundamental parts: (1) A cell body, a bulbular enlargement usually near one end of the neuron, which contains the nucleus of the nerve unit, nourishing and maintaining the life of the cell. (2) An axone, a long gray filament with branches. The axone has a thick protective covering of white matter known as the medullary sheath. Axones vary from less than an inch to five feet in length, and carry impulses away from the cell body. (3) Dendrites, treelike branches proceeding from the cell body itself, convey excitation from other cells.

Kinds of Neurons. There are three major types of neurons. (1) The sensory or afferent neurons with dendrites in some of the sense organs (receptors), such as the eye, ear, skin, conduct impulses from a receptor to the cord or central nervous system. (2) The associative

or connecting neurons, with dendrites and axones in the cord and brain, conduct impulses from one center of the brain, or cord, to other centers. (3) The motor or efferent neurons, with dendrites in the gray matter of the cord, or brain, discharge their impulses to the muscles (effectors).

The Synapse. The region of contact between the end of one neuron and the beginning of another in a neural chain is called a synapse. At the synapse, neurons are in functional contact but they do not fuse together. The impulse is transmitted from one unit to another so that the excitation is facilitated, causing a response situation. Usually there are many neurons in contact in any synapse. The following diagram will illustrate the terminal arborizations or neural branchings.

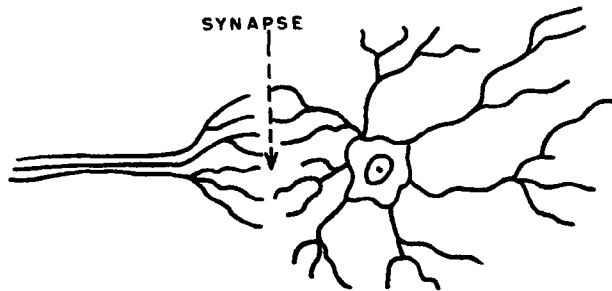


FIG. 2. Arborization of a neuron.

The Function of the Neuron. When a neuron is stimulated an electrochemical impulse is aroused within its fibers. The impulse passes rapidly from one neuron to another synaptically as a wave of excitation. This function is known as conductivity. Three important characteristics of neural activity have been noted.

1. **THE "ALL OR NONE" LAW.** The electrochemical excitation by which the impulse is propagated in man's neurons travels about 400 feet per second. It arouses the neuron either to its full activity or not at all. Under normal conditions of stimulation the nerve cell conducts many successive impulses in a unit of time; therefore, a more intense stimulus creates a greater response and uses a larger number of neurons.

2. **REFRACTION OF THE NERVE IMPULSE.** After the nerve has been excited there is a tendency for the neurons concerned to rest momen-

tarily. This inactive phase is at first complete but after brief inactivity excitability is quickly restored.

3. **POLARITY.** Ordinarily the nerve impulse travels through the neurons in one direction, from dendrite to cell body and on through the axone, from receptor to effector.

THE GENERAL NERVOUS SYSTEM

Voluntary and involuntary activities of the body, that is those activities performed with conscious effort and those that occur even without our knowledge, are controlled by the nervous system which is the functional medium of human behavior. The nervous system is composed of three major systems, closely integrated and mostly coordinate in function. These systems are known as the **autonomic system**, the **peripheral system**, and the **central system**.

THE AUTONOMIC NERVOUS SYSTEM

The autonomic system, sometimes called the vegetative system because it tends to operate automatically, consists of certain nerve fibers and cells which are chiefly concerned with the regulation of activity in the smooth muscles, glands and the heart. The autonomic nerves and cells make a dominant contribution in the establishment of human feelings. They embody two series of ganglia, named according to their location: thoraco-lumbar or **sympathetic** division, and the cranio-sacral or **parasympathetic** division. Figure 3 indicates the anatomic position of these divisions.

The cranial or upper fibers grow out of the lower brain centers and consist chiefly of the vagus nerves which send branches to the heart, stomach, intestines, and other internal organs.

The sacral or lower fibers arise from the lower segments of the spinal cord, supplying ganglia with nervous function necessary to bodily emissions. The cranio-sacral or parasympathetic division of the autonomic system maintains the normal operation of the viscera and provides a means for the psychological attitudes of quietness in the human states of restfulness and repose.

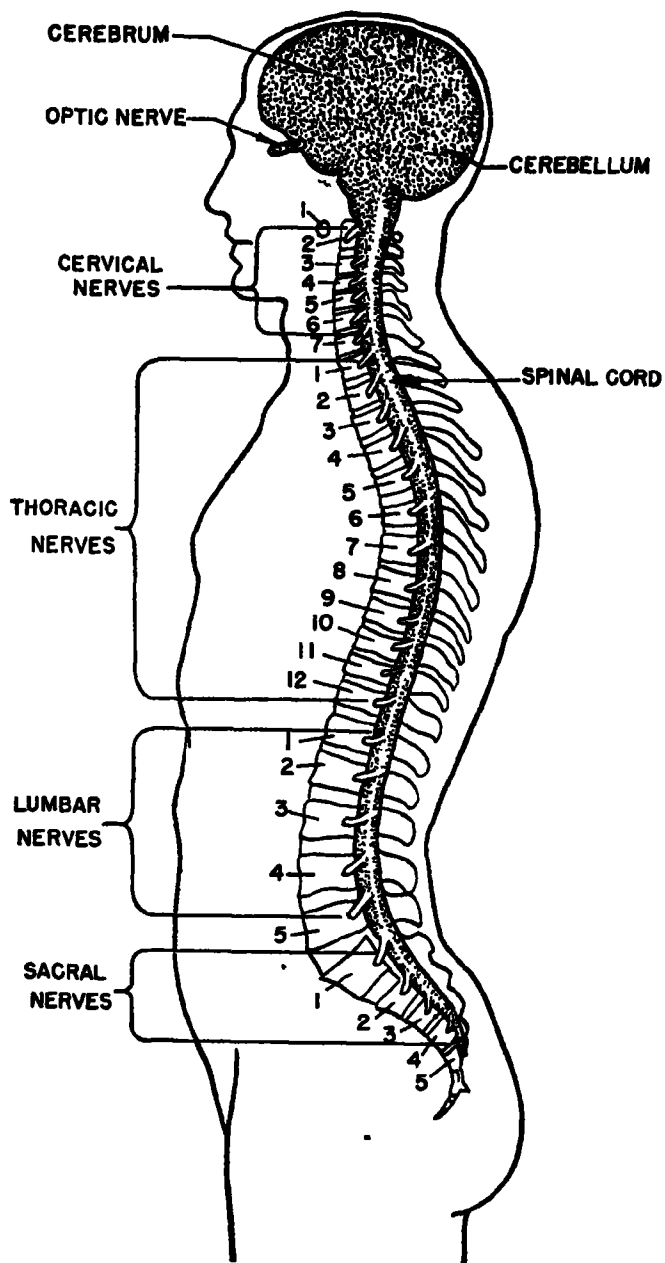


FIG. 3. Divisions of the nervous system.

The Sympathetic Division of the Autonomic Nervous System

The thoraco-lumbar fibers are located in the chest and abdomen. They originate from segments in the middle of the spinal cord and pass to each of the visceral organs. The sympathetic innervation tends to accelerate the heart beat, deepens breathing, and controls the digestive process. It operates effectively in emergency situations, as when great exertion is needed in strong emotional states.

The sympathetic and parasympathetic ganglia perform opposite functions. Both divisions operate in the organism automatically but with antithetical effect, known as reciprocal innervation; thus one system excites and the other inhibits.

THE PERIPHERAL NERVOUS SYSTEM

The peripheral nervous system is composed of the spinal and cranial nerves, attached respectively to the spinal cord and brain. All spinal nerves and some cranial nerves contain both sensory and motor fibers. These fibers join the receptors with their central terminals and convey impulses to the effectors. The coordination of these impulses occurs, therefore, within the brain or cord where the major synapses function.

Spinal Nerves. There are thirty-one pairs of spinal nerves, grouped and named according to the region of their spinal cord attachment. They emerge between the segments of the vertebral column, one pair proceeding to the right and another to the left, conveying motor impulses to the muscles of the trunk and limbs and bringing in sensory impulses from the skin, muscles, and visceral receptors. A listing of the spinal nerves from the top to the base of the spine follows:

- 8 pairs of cervical nerves ;
- 12 pairs of thoracic nerves ;
- 5 pairs of lumbar nerves ;
- 5 pairs of sacral nerves ;
- 1 pair of coccygeal nerves.

Cranial Nerves. Cranial nerves issue directly from the brain. There are twelve pairs proceeding chiefly to the sense organs and

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muscles of the neck. Each pair has been given a name and number, as follows:

The Olfactory Nerve (I), for the reception of the sense of smell.

The Optic Nerve (II), for the reception of sight.

The Oculomotor Nerve (III), for movement of the several eye muscles.

The Trochlear Nerve (IV), for movement of one eye muscle.

The Trigeminal Nerve (V), for reception of sensations from the face, and for movement of the chewing muscles.

The Abducens Nerve (VI), for the movement of one eye muscle.

The Facial Nerve (VII), for the movement of the facial muscles, for the reception of the sense of taste and for the secretion of saliva.

The Auditory Nerve (VIII), for the reception of the senses of hearing and equilibrium.

The Glossopharyngeal Nerve (IX), for the reception of taste and for movement of the pharyngeal muscles.

The Vagus Nerve (X), for the control of activity in many of the thoracic and abdominal organs.

The Spinal Accessory Nerve (XI), for the movement of some neck muscles.

The Hypoglossal Nerve (XII), for movement of the tongue muscles.

It will be observed that the various receptors functioning in the interests of vision, hearing, taste, smell, and equilibrium depend on the cranial nerves for their basic psychology. That other cranial nerves carry motor impulses to the muscles of the eyes, jaws, tongue, face, and neck, establishing the basic effector process. The vagus nerve acts as a sort of wandering pair, proceeding to the trunk, serving the heart, lungs, digestive organs, and influencing breathing and digestion. Indeed the word "vagus" means "wandering" and the name was given from its wandering path. It is sometimes known as the pneumogastric nerve.

THE CENTRAL NERVOUS SYSTEM

The central nervous system comprises the several important sections of the brain and spinal cord. The most important parts of interest to the psychologist are the spinal cord, the brain stem and cerebellum, and the cerebral hemispheres.

The Spinal Cord: The Lower Levels of Neural Response. The spinal cord is the reflex pathway between the brain and the remainder of the body. It contains many tracts, some of which are sensory (ascending), and others which are motor (descending).

The cord is cylindrical in shape, tapering, with deep grooves in the front and back, and contains a central channel. The inside of the cord is gray matter to which are appended the thirty-one pairs of spinal nerves. The outside is white matter, and the entire structure is enclosed in thick membranes within the spinal column. The gray matter, H-shaped in pattern, forms one long ganglion within the center of the cord. The prongs of the H-shape which point toward the front of the body are called ventral (anterior), and those toward the back are termed dorsal (posterior). The gray matter of the ventral horn is composed of the cell bodies of motor neurons which carry impulses to the muscles. The gray matter of the dorsal horn consists of dendrites of the sensory neurons located in ganglia just outside the cord. The white matter contains axones with medullary sheaths of sensory, motor, and associative neurons which carry impulses from one level of the cord to another and to and from the brain.

Functions of the Spinal Cord. The spinal cord establishes the automatic production of **spinal reflexes**. These reflexes are the simplest forms of sensory-motor response, and give foundation to the more complex reflex behavior. The withdrawal of the hand from a hot object and the knee jerk are examples of simple spinal reflexes. The common skills, which come with practice, are examples of the more complex behavior.

A second function of the cord is to **coordinate reflexes** in the lower forms of behavior, effected by the associating or connecting neurons which convey sensory impulses to many motor neurons. This func-

tion makes the cord an important part of the integrating neural mechanism, synthesizing large groups of muscles and large areas of the body.

A third function of the cord is to distribute impulses upward and downward from body to brain and from brain centers to the motor structures of the body. In this function the cord acts as a connecting cable, employing the projection pathways for the adequate distribution of reflex behavior.

The Brain Stem and Cerebellum: The Intermediate Levels of Neural Response. The brain stem is a continuation of the spinal cord and consists of the medulla and the thalamus.

The medulla oblongata connects the cerebral section of the brain with the spinal cord, and is important for the transmission of impulses. It is a relatively simple structure forming a bulbous enlargement at the head of the spinal cord. Bundles of fibers pass through it from the cord to the higher brain centers.

Its special functions are: (1) To establish reflex connections between the receptors and the muscles of the head. Several cranial nerves emerge from the medulla, proceed to the muscles of the face, tongue, and visceral organs. The receptors for taste, hearing, equilibrium, and the skin centers of the head and neck region make contact with the medulla and act reflexly. (2) To regulate reflex impulses. The medulla acts as a corridor for axones connecting the cord with the brain, regulates rhythmic responses, such as breathing and heartbeat, and initiates many basic reflexes in the stomach and intestines.

The thalamus, with its two egg-shaped lobes, one on either side of the brain-stem and just above the mid-brain, is an important brain mechanism. Its functions are: (1) To receive and relay sensory impulses. All general sensory neurons end in the thalamus and make synaptic connections with other neurons which carry impulses to terminals in the cerebral centers. Of the special senses the olfactory is the only one which passes through the thalamus. (2) To relay some motor impulses from the cerebral centers to the effectors. (3) To act as a center for emotional response (Cannon).

The cerebellum is a large structure lying behind the medulla and beneath the cerebral hemispheres. It is a heavily convoluted grayish tissue, and its special functions are: (1) To serve as a reflex center in motor balance and equilibrium. (2) To maintain muscle

tonus, controlling posture and muscular movements. Thus, it regulates the strength of contraction in voluntary muscles, governs steadiness of body posture and smoothness of motion in voluntary action.

A large transverse band of decussating nerve fibers, known as the pons connects the cerebellum with the cerebrum, and contains the nuclei of cranial nerves V, VI, and VII, as the medulla oblongata contains the nuclei of cranial nerves VIII, IX, X, XI, and XII.

The Cerebrum and Cortex: The Higher Levels of Neural Integration. The cerebrum, or "fore-brain," with its highly developed cerebral hemispheres, is the neural center for all skilled activities and learning. It is the organ for coordinating and integrating complex responses through its highly specialized cortex. This center operates in all activities involving voluntary action, intelligent adaptive responses, and creative thinking. Weighing about fifty ounces, the cerebrum consists of white matter or connecting axones, and gray matter or the cell bodies of neurons forming a thin outside layer of cells called the cortex.

The cerebral cortex, the highest center in the brain to which all other parts are subordinate, is the seat of all neural reactions involved in complicated skills and higher learning. In it all voluntary impulses are coordinated. To perform the higher functions of human life the cortex is elaborately connected with all parts of the nervous system. These complicated skill-functions are actuated by three kinds of neural activity within three neural centers: (1) the projection fibers, (2) the association fibers, and (3) the commissural fibers.

The projection fibers ascending from the cord and brain stem connect sense organs with the cortex; descending into the cord and brain stem they connect the cortex with the motor areas and the muscles.

The association fibers connect sensory and motor areas in the brain.

The commissural fibers connect the symmetrical regions of the two hemispheres of the brain through the corpus callosum (a thick band of fibers lying above the third ventricle) uniting the two hemispheres of the cerebrum. Figure 4 is an illustration of this.

Brain Areas. The cerebral cortex governs sensory, association, and motor functions, hence it is convenient to speak of specific areas of the cortex, such as the sensory areas, the association areas, and the motor areas.

(1) **SENSORY AREAS.** Certain parts of the cortex are connected with the sense organs or receptors and relate themselves to man's conscious experience: for example, the visual part of the cortex is just as important as the retina of the eye in the function of seeing;

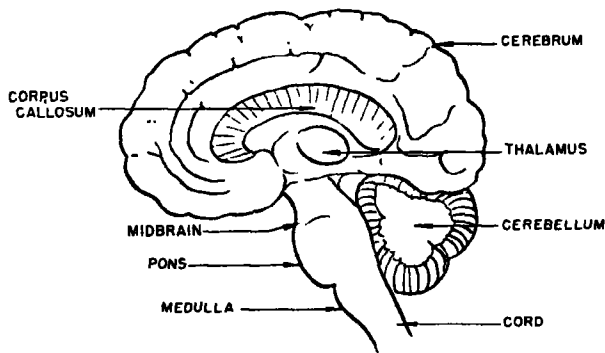


FIG. 4. Divisions of the brain.

its removal results in blindness. Similarly, fibers for smell (and probably taste), hearing, and tracts for touch and movement, terminate in the sensory cortex. So we speak of a visual area, an auditory area, an olfactory area, and the somesthetic area of the cerebral cortex.

(2) **THE ASSOCIATION AREA.** Any part or region of the cerebral cortex occupied by neurons which connect one projection area with another, and which acts to coordinate and extend the impulses that arise in other parts of the cortex, is an association area. The elaborate system of associating fibers permits the coordination of skilled movements, bringing together the sensory and motor functions. Thus, associations of the motor cortex that move the larynx results in the ability to speak when the regions are coordinated; associations of the visual area with the higher ocular regions results in the ability to read when neural integrations take place.

(3) **THE MOTOR AREAS.** The principal motor area of the cortex is the frontal lobe, which controls the movements of the legs, arms.

neck, speech organs, and other bodily activities. In this area are the pyramidal cells, so called because of their shape, from which motor impulses occur. Every final motor nerve receives impulses from many parts of the nervous system: from the cord, medulla oblongata, mid-brain, cerebellum, and important reflexes ordinarily follow.

EFFECTORS

The Motor Mechanism. The stimulus and its "drive" are coordinated primarily in the receptor-adjustor process; it remains for the excitation to be converted into human response. This action is accomplished by the effectors, which consist of cells differentiated in the process of man's evolution, and which act as termini of the nervous arcs. Effectors, therefore, are organs of reaction, organs which receive excitations from the nervous system and act in their own characteristic manner. The chief effectors are muscle fibers and glandular tissues. Muscles are divided into two groups: striped and unstriped muscles. Glands are also divided into two groups, the duct and ductless glands.

Two kinds of muscle effectors have been recognized, namely: somatic effectors and visceral effectors.

Somatic Effectors. The somatic effectors are the striped or skeletal muscles. They are attached to the bony framework of the body, the bones of the skeletal system, mouth, and skull. There are some 600 striped muscles in the somatic-effector group, and they constitute almost one-half of the total body structure.

THE FUNCTION of the somatic effectors is important in learning skills of the motor kind, since they refer to the framework of the body. They are the muscular mechanisms for all overt responses, and accomplish changes of position and movement, and give tonus and rhythmic activity to the body. Their characteristic activity is either in contraction or relaxation, and they usually work in pairs, with antagonistic action causing important chemical changes within their structures.

Muscle tonus helps to maintain postural reactions, keeps the body alert, and ready to respond. Chemical changes are expressed in loss of contractive power after the tissue has been repeatedly

stimulated, and this loss of energy accounts for fatigue. Muscular coordination produces strength, speed, and precision of movement. The muscle fibers, of which there are hundreds in each structure, are insulated from each other by a membrane and are stimulated individually by efferent nerve units. One nerve fiber spreads its fibrils over several muscle fibers which terminate in specialized structures called motor end-plates. The unit of stimulation, including a single nerve fiber, fibrils, end-plates, and muscle fibers stimulated by them, is called a motor unit. Many motor units function together in the activity of an effector.

Somatic effectors are innervated from fibers within the cerebrospinal region of the nervous system, and they are closely related to special nerve processes within the autonomic system.

Visceral Effectors. The visceral effectors are the unstriated, involuntary muscles found in the hollow viscera, arteries, veins, and in the duct and ductless glands. The visceral effectors function interoceptively, and are related to the affective side of human life, making internal organic adjustments. These effectors act more slowly than the somatic effectors and their action is relatively independent, automatic, involuntary, being largely uninfluenced by the conscious activities of the organism. They are innervated by fibers from the autonomic system and by glandular secretions in the blood stream.

THE GLANDS AS EFFECTORS. The glands, representing the second major group of effectors, are aggregates of cells specialized for the secretion of certain chemical substances which function primarily in the regulation of control of growth. Glands are of two kinds: duct and ductless. Duct glands pour their secretions through some cavity or passage, or to the surface of the skin. Some of the more important duct glands are the digestive glands in the wall of the stomach and intestines, the salivary glands which empty into the mouth cavity, the pancreas and liver, sweat and sebaceous glands of the skin, the kidneys, and the accessory sex glands.

More important for psychological function are the ductless glands or endocrines. They produce extremely potent and complicated chemical substances known as hormones. They have no ducts, their products being picked up by the blood stream or lymph stream

as these circulate through the glands. When these autocoid substances, produced by the cells, pass into the circulatory fluid of

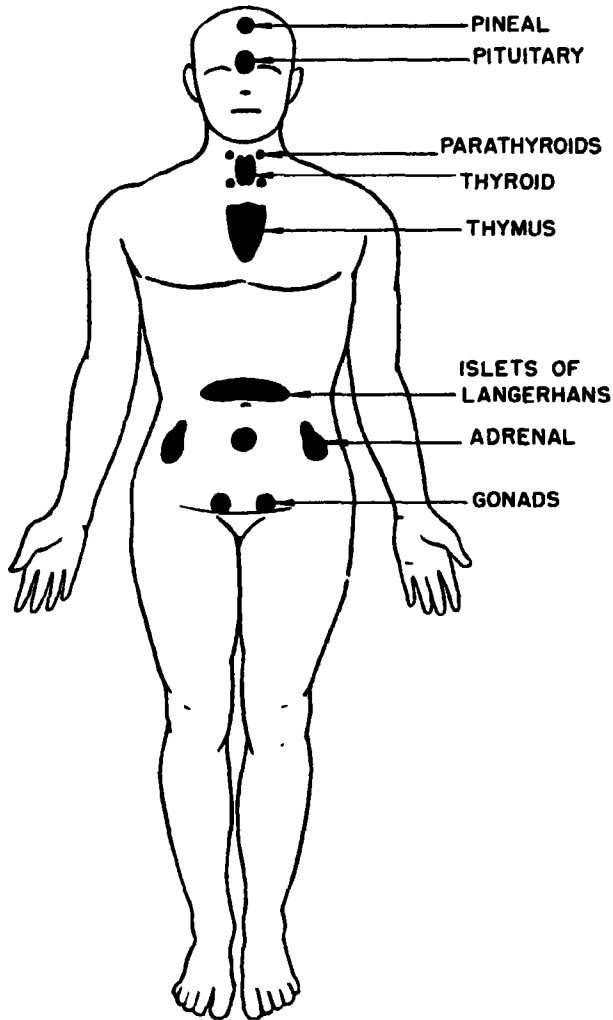


FIG. 5. The endocrine glands.

the body widespread and coordinated effects occur. The most important endocrines are:

1. *Thyroid*. The thyroid gland, consisting of two lobes of deep red glandular tissue, is situated on either side of the larynx and

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trachea. It weighs an ounce or slightly more, and is composed of many tiny sacs lined with secreting cells, jelly-like colloid and iodine filling the intervening spaces. In adults suffering from goiter this gland may weigh as much as a pound.

The active principle of the thyroid gland is thyroglobulin which produces strong psychological effects. Small increases in thyroglobulin will speed up chemical reactions and create physiological changes which show in neuromuscular behavior. Without thyroglobulin normal development is impossible and mental deficiency may result. The thyroid gland controls metabolism. Underactivity fails to stimulate physical and mental growth and may result in cretinism, which is characterized by stunted growth, obesity, and marked retardation of mental development. It may be largely responsible for apathy, lack of interest in behavior, and similar shortcomings in normal individuals. Overactivity of thyroid secretions produces uncertain temperament, overt movement, impulsiveness, nervous excitability, with no loss of intelligence.

2. *The Adrenals.* There are two adrenal glands, resting on the upper part of the kidneys. Each gland consists of two distinct parts: the medulla and the cortex. The medulla or center of the gland consists of cellular chromaffin tissue, from which adrenin is derived. Adrenin counteracts fatigue, speeds up the oxidative processes in the tissues, and prepares the individual for physiological emergencies. Adrenin secretion is increased by all stimuli that arouse strong emotional responses. The cortex of the adrenals yields auto-coids necessary for life and an undetermined chemical substance called cortin. Removal of the adrenal cortex is always fatal. Disabilities, such as tumors of the cortex, may produce sexual precocity. In such cases a boy of seven may attain normal adult sexual development and have a man's voice. A girl with similar precocity may show excessive signs of masculinity in voice and face and other parts of the body.

3. *Pituitary.* The pituitary gland (also called hypophysis cerebri) is situated at the central base of the brain and consists of a large anterior lobe composed of epithelial tissue, and a smaller posterior lobe consisting of nerve cells which support the vesicles and secreting cells. The gland controls the skeletal growth of the human body. The anterior lobe produces hormones which regulate growth.

Its overfunctioning before the bony growth of the body is completed develops giantism, as seen in unusually tall people; underfunctioning accounts for retarded physical development or dwarfism, evidenced in definitely undersized people.

4. *Thymus*. The thymus gland is located in the upper thorax. It reaches its greatest size about the time of puberty and then gradually atrophies. It has no proved endocrine function but is thought to be associated with prepubescent physical growth.

5. *Gonads*. The sex glands or gonads, with their several parts, are concerned with the function of reproduction, and with the control of secondary sex characteristics such as body shape and contours, distribution of hair on the body, the development of voice characters, masculine and feminine traits, and probably mental and emotional differences.

PSYCHOLOGICAL FUNCTIONS. While the endocrines are commonly regarded to be the primary hereditary factors in life and growth they are also the means of responding to stimulation. They vary in function in different individuals and with particular circumstances. As such they produce variability of activity, growth, skill, and emotivity. In general their metabolic and structural changes affect numerous activities indicated in the individual behavior of man.

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ORIENTATION

We have noted the essential physiological structures of the human organism which provide the mechanism from which psychological responses are derived. This organism is our machine. Now it is necessary to inquire precisely, what makes this organism go, what makes it react, and give a psychological product. This question is answered by citing four determinants which represent the minimum of what is often called the motivation process. These determinants are: stimulation, drive, conditioning, motivation.

1. **Stimulation.** A stimulus is a form of physical energy which creates a change in the receptor or sense organ and thereby arouses organic activity. Stimulations are vibrational, mechanical, chemical.

2. **Drive.** A drive represents intraorganic tension of instinct-like variety. Some drives are vegetative, shown in the urge for food, rest, mates; some drives are emergency impulses or pressures which express themselves in the urge to escape, defend, attack.

3. **Conditioning.** Conditioning is more frequently called "the conditioned reflex." It is the ability to associate a new stimulus with a former situation which by itself is biologically adequate to form a response. The new stimulus operating simultaneously with the old stimulus becomes so engrossed in the organism that it alone, or by itself, becomes capable of creating the original response. Sometimes this response is advantageous, sometimes it is not. Many of our emotions, seen in likes and dislikes, are the result of conditioning. This reflex activity soon becomes a hard and fast habit, hence conditioning is a means whereby we create good and bad habits of response and conduct.

4. **Motivation.** Motivating behavior is a dynamic incentive which occurs when the organism has gained sufficient experience to make its responses preferred, chosen, purposed. It is a means of seeking and gaining desired ends or goals. When this process becomes highly socialized it operates in a manner which we recognize as the desire for prestige, for accepted appearance, for cooperation, for wealth. Such activities are frequently called social motives.

3

The Determinants of Psychological Activity

Anatomy and physiology, as presented in the previous chapter, represent the basis of life and learning. The responses of life, resulting from the initial reaction of this vast and intricate machine of sense organs, nerves, brain, and muscles require certain determining factors to create behavior and psychological response. Certain forces within and without the organism add their energizing powers, change potential capacities, modify the body structures, and prepare the organism for quantitative and qualitative responses. The forces which perform this reaction-role, involving essential psychological activity, may be stated as: (1) stimulation; (2) drive; (3) conditioning; (4) motivation. On this reaction-basis the human personality functions through its various components, such as intelligence, ability, learning, feeling, perceiving, recalling, imagination, thinking.

STIMULUS PATTERNS

Definition of Stimulus. The word stimulus has been used widely in psychological literature. Popularly it is considered to be a form of energy resident in the environment, an external or internal object, or aspect of such object, which arouses or alters experience; hence we say that sound is a stimulus. This usage is technically incorrect. To stimulate the organism is to apply a stimulus to a receptor which inaugurates nerve impulses by creating excitations within the physiological parts arousing therewith organic activity.

Stimulus Change in the Receptor. A stimulus, correctly stated, is any physical energy which creates a change within a receptor. It

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is a form of energy acting upon a receptor arousing behavior or awareness. A change within the receptor may be in the form of vibrations, such as light-rays; sound waves which affect the auditory receptors and produce sound; mechanical pressures on the skin; or chemical changes which give rise to tastes and smells. All forms of energy proceed from a stimulating situation, but the principal activity is within the sense organ that transfuses impulses into experience. Usually the stimulating situation involves more than one receptor which accounts for the ability of the individual to react comprehensively to any physical event, making for complexities in skills and conduct.

Adequate Stimulus. The change occurring in the sense organs initiates impulses which are conducted through the paths of neural transmission, creating changes in the function of the living tissue. It is important that the stimulus shall be adequate in evoking proper response through the normal action of a receptor. This adequacy of stimulus is characteristic of effective physical energy, and represents a type of stimulus which normally excites a given receptor.

Characteristics of Adequate Stimuli. Adequacy of stimulus involves the effective use of time, intensity, adaptation, and continued activity. The stimulus must endure for a minimum of time before it can provoke an excitation, and, in the circumstances, there is involved what is called initial lag in the receptor mechanism. Sometimes this initial lag is brief, sometimes it is long, according to the situation and the readiness of the individual concerned.

Along with the time element there is the matter of minimal intensity, that is certain stimuli must be strong enough to elicit a response. Stimuli must be sufficiently intense to create excitation within the receptor. This element of intensity means that the liminal threshold of sensitivity must be established or there is no reaction and consequently no learning. Above this threshold, or determining point on the stimulus-scale, the stimulus is termed "supraliminal," meaning that the stimulus is creating the greatest degree of sensation that the organism is capable of experiencing. Below this threshold the stimulus is "subliminal," and too faint in its degree of sensitivity for reaction. When the stimulus is ade-

quate, perception should be distinctive and certain, provided other factors in mental activity are forthcoming.

All stimuli in the process of excitation become sufficiently continuous and progressive to create adaptation within the receptor. Either the stimulus fortifies a receptor in its reaction or it brings on fatigue. Adaptation, for example, in ordinary visual stimuli, such as the lighting facilities of a lamp or the temperature of a room, would thereby provide adaptation in color and temperature. In the case of a ticking clock, which becomes unnoticeable with adaptation, there follows a probable fatigue-reaction.

Stimulus Lag, or Terminal Lag. When the stimulus has completed its work, and been withdrawn, it is to be noted that the receptor ordinarily continues its task. This factor is known as terminal lag, or the continuation of the sensory impulse after the stimulus has ceased. Probably this phenomena accounts for much that we call habit, and possibly memory.

Total Stimulus Patterns. The total stimulus pattern involves the activity of all possible receptors, and a unification of their several sensitivities. Note, for example, the many sensitivities contained in a simple act, such as taking an orange. First, the orange is seen (visual), the orange is seen to be round and colored (visual); we reach to grasp the orange, survey its contour with our hands (tactual, kinesthetic); we observe that the orange has a particular smell (olfactory); we peel the orange (tactual, kinesthetic); we taste the orange, noting its sweetness or other flavor (gustatory).

Modifications and Adjustments Within the Organism. Just what happens in the nervous system, and especially the brain, in the transit of impulses after the organism has been stimulated, is complex and not completely known. Integrative action is possible when all nervous and muscular parts, with their intimate connections, perform or function under proper physiological organization. In this event the modification and combination of neural excitations leads to normal adaptive activity, such as learning. Therefore, out of this stimulus-pattern with its normal reaction to the particular stimulus there occurs a characteristic response. Then, it can be said, the receptors have been duly excited, impulses are underway, and the nervous system is reacting, behaving. The afferent discharge from the stimulated receptors, selecting

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the dominant stimuli, develop responses which engage the action of the effectors. With such a variety of energy operating within the senses it is clear that a foundation is laid for sense-discrimination and the interpretation and meaning of sense experiences (which we shall later know as perceptions) in the light of the many phases of space, time, movement, and every other aspect of physical experience.

Stimulus and Environment. The psychological environment, in which the stimulus is related, refers to the physical activities that affect the organism. It is divided into explicit and implicit forms. The explicit environment refers to physical objects and activities external to the organism that stimulate the body from without. The implicit environment refers to action within the body formed by the activity of multiple organic structures stimulated from within. As a result of the interplay between these two forces through the stimulation of the receptors with their contiguous organic processes, responses effected by the muscles and glands produce behavior, reaction, and conduct in mechanical sequence.

DRIVES

A second means of promoting the behavior of the organism is initiated by shifts in physiological balance, called drives. The "drive" is an instinct-like activity within the organism leading to general excitations and psychological response.

The Significance of Drives. The physiological condition called a drive is so named because of intraorganic processes which generate internal stimulation causing tension. Hunger, or the need for food, resulting in rhythmic contractions of the stomach, is a drive leading to food-getting. The organism in the drive-state fulfils what is understood by such terms as urges, appetites, which are sometimes called the simpler motives, expressed in hunger, thirst, fatigue. The drive manifests a tendency in which activity is directed towards, or away from, a specific object or situation. When the drive is largely or wholly dependent upon the activity of the vital organs of the body, including the glands of internal secretion, it is referred to as **tension**. Hence, it is common to speak of **vegetative drives** for food, rest, mating, offspring; **emergency drives** for

escape and defense. The direction the drive-activity pursues depends upon the specific stimuli supplied by the environment. In the case of the hunger drive, if the stimuli connected with it is present, such as a supply of food, the response will lead to the elimination of the drive.

The Broader View of Drive. The concept of drive is often made broad enough to include cerebral conditions, desire for a particular object, and mental set, which may be called an intellectual drive conditioned by the native capacity of the individual. Carrying this view forward it is convenient to speak of social drives, acquired from one's heritage; and even drives arising from an individual's sense of values. This broader interpretation may be open to considerable objection since intellectual and social drives consist of much more psychology than drive phenomena permit.

The Physiology of Drives. The physiology of drives is obscure. All the fundamental activities of the organism are doubtless involved, which would appear to make the drive a prepotent reflex, or a prepotent habit which acquires a compelling power controlling the immediate behavior of the individual.

Contributions of Animal Psychology. Psychologists investigating the behavior of animals offer findings which throw light on the true nature of drives. When an animal in an experimental situation, such as puzzle box, maze, or similar laboratory procedure, is quiescent, comfortable, inactive, resting, there is no tension and consequently no drive. In such circumstances there is little or no learning. The animal's behavior is complacent and habitually at ease. When, however, an urge arises, when an adjustment is needed, the animal stirs itself and becomes a creature of impulsion, of tension, for which no habit pattern exists. New modes of response, which are new learning impulsions, demand changes in the organism. Situations, such as withholding food from an animal until the learning task has been completed, teach a variety of behaviors which appear as drives. Punishment, confining the animal to solitude, and similar devices create a drive phenomenon which is expressed in attempts to escape.

Drives in Human Living. Can we deduce evidence from animal experimentation, and related factors in human behavior, that will help us understand the meaning of drives in man? Are tensions

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induced by verbal means comparable with desires in social situations? Dunlap identifies drive with desire, classing drive, desire, urge, wish, as emotions, but without regarding the terms as synonymous. He speaks of nine groups of primary desires as follows:

1. Alimentary desire (hunger and thirst).
2. Excretory desire.
3. Protection desire.
4. Activity desire.
5. Rest desire.
6. Amorous or erotic desire.
7. Parental or philopedic desire.
8. Preeminence desire.
9. Conformity desire.

Apparently drives are too numerous to be enumerated conclusively. Especially is this true when we recognize the broader view, whereby drives find outlet in art, literature, science, religion, commerce, politics, provided the stimulating situations relating to these expressions are present. In the same way countless desires come to have a prevailing social pressure, as seen in all attempts to achieve, to succeed, to possess. These social drives spur the individual on with the urge for renown, for wealth, for power.

Dynamic Interpretations. In contrast with the functional view of drive which begins with the native urge, the inherited tendencies to respond, which are expressed in reflex and instinctive behavior, there is a dynamic interpretation of drive. This view maintains that habit, once established, possesses dynamic powers which modify behavior. To this extent Woodworth speaks of instinct, emotion, and habit as motives; once they become functionally active they furnish the drive for other mechanisms of response. In this case, motive is the mere antecedent of ordinary activity and representative of the dynamic factors in behavior.

CONDITIONING, OR THE CONDITIONED STIMULUS

The conditioned response consists of "an originally ineffective stimulus that becomes capable of arousing response because of associated learning."¹ Every act of our daily life is believed by the

¹ Shaffer, Gilmer, and Shoen, *Psychology*, New York: Harpers, 1940, p. 502.

reflexologists (out and out believers in the mechanically determined response), to involve conditioned responses which result from conditioned stimuli. Hence, changes in the connections between stimuli and responses are called "conditioning." Burnham² has defined this process in the following manner: "A conditioned reflex is a response to a stimulus which has been associated with a biologically adequate stimulus and hence produces the same physiological response. Such reflexes, conditioned by associated stimuli, may be looked upon as the elements in habit, and habit regarded as a system of conditioned reflexes." Pavlov³ gives the steps in the conditioning process, and has developed an elaborate technic showing that the sensation from any receptor organ may be a conditioned stimulus by repeated association with a biologically adequate stimulus. The attachment of a response to a stimulus which did not have the power to arouse it is indicated by: (a) increasing the range of stimuli which brings about a certain response, (b) increasing the number of responses made to a certain stimulus, and (c) attaching the response to but one part of the total situation which previously had aroused it. The detachment of a response from a stimulus is indicated in: (a) negative adaptation which occurs when the stimulus is harmless, such as growing accustomed to noises, and (b) the learning of an avoiding response when a painful effect is involved, as when danger is threatened.

MOTIVATION

The psychological concept of motivation provides for all the causes of psychological activity. Often it is declared to include the various forms of stimulation in the response of the total situation; sometimes it is declared to exist in its own psychological right.

Psychological Activity Is Dynamic. Reactions occur from ordinary stimuli, and in turn become the causes of other reactions. The name frequently given to this process is motive. A motive might be ascribed to any condition which disposes the organism to act in a preferred way, serving as an incentive, or providing an incentive for an act. Accordingly, motive implies a degree of consciousness or

² Burnham, William H., *The Normal Mind*, New York: Appleton, 1924, pp. 14-15.

³ Pavlov, Ivan P., *Lectures on Conditioned Reflexes*, New York: Liveright, 1936.

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awareness of an end or goal. It implies a purpose of achieving an end that is definite.

Tendencies to Act. Broadly speaking, motive is concerned with all tendencies to act, and in this sense may indicate the physiological drives, sometimes denoted by the term "simple motives," as observed in hunger, thirst, fatigue. Many interpretations of motivation have been given. The following are in common usage:

SIMPLE ORGANIC MOTIVES, in which, for example, hunger motivates the act of eating.

NEUROMUSCULAR SET, in which the motive is predominantly neural, or muscular, as in recall abilities involving the integration of stimuli.

PURPOSE, OR END-SET, where the motive attests the significance of the goal set before the individual to be achieved by action characterized by intent. Conscious motivation represents intent, as in the desire to work, to learn.

SOCIAL MOTIVATION considers the formed relationships of physiological and conscious motivation in which the reactions of people take on social significance. Important driving stimuli in social motivation are: social interests, the desire for prestige, appearance, competition, cooperation, the urge for wealth, and like factors prominent in social living.

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ORIENTATION

Individual needs, desires, efforts must be organized into adequate behavior so that proper responses are made to the problems of life. The psychological processes of adapting man to his essential environment is called adjustment. The human organism must meet many needs in order to survive. It must adjust itself to the physical facts of air, nutrition, respiration, circulation. It must avoid internal and external accidents. It must solve intellectual problems. It seeks success, approval, happiness, and health. Psychology is interested in the whole person, in adjusted behavior, and it is this interest that qualifies psychology as a science of human adjustment.

Adjustment represents a continuous effort to relate the organism normally to circumstances, called situations, which are also continuous. Each circumstance, event or situation must be met effectively, hence situations act upon the sense organs and give the organism a command of the immediate environmental needs. Reactions and responses follow from which conduct is made.

Responses may be classified in the following general groups. (1) **Reflex**: reactions may be physiologically automatic. (2) **Emotion**: reactions may be glandular, arising from organic feelings. (3) **Perceptual**: reactions may be psychological, evidenced by the ability to know, to remember, to imagine, and to think. (4) **Thinking**: reactions may be intellectual. (5) **Habit**: reactions may be well-learned, habitual.

On these possibilities is formulated the psychological principle, expressed by Shaffer,¹ that "the total behavior of man consists in making responses to situations"—events and circumstances which call continuously for adjustment. Adjustment, then, is a cause and effect relationship adequately met, being the balanced inter-relationship of forces within the individual and forces in his immediate environment.

Much of our everyday life is reflex behavior, and habitual behavior formulated over a long period of time. Much of it is emotional behavior, for no one can live normally without experiencing satisfactions and dissatisfactions, likes and dislikes, joys and sorrows, and these feelings belong to our emotions. But, beyond them are the intelligible responses—perceptions, or our observable intimacies with things and events. When we are faced with difficulties emanating from problem situations, then we are required to solve them by thinking.

¹ L. F. Shaffer, *Psychology*, p. 25.

4

The Response Process

Psychological response, or reaction, as it is frequently called, consists of complex factors, variously coordinated. Basically, the response consists of (1) the reception of stimuli by the sense organs; (2) the integration or adjustment of impulses within the organism, and (3) the action of the organism in discharging the impulses through the effectors which operate by means of muscles and glands.

THE REACTION ARC HYPOTHESIS

The Situation-Response Process. The foundation of all responses is the reflex arc. Except in its simplest form involving unlearned behavior, as in simple reflexes, reaction is initiated by an environmental situation. Such a situation stimulates the sensory (afferent) neurons in the receptors where impulses arise. Impulses thereupon pass to the adjustment centers in the central nervous axis, and along motor (efferent) neurons to the effectors. The following formula outlines the process:

(s) — R. sensory paths → (A) motor paths → E. — (r)

Following is an explanation of these symbols:

The (s) or situation represents the stimulus pattern which affects the individual during the receptive period of the physiological process. The term situation is broader than environment since it includes both external and internal stimuli.

The R. signifies receptor or sense organ without whose function impulses cannot be aroused. Receptors are the sense gateways for all response.

The (A) represents adjustors or adjustment. Centers within the neural processes, especially the ganglionic part of the reflex

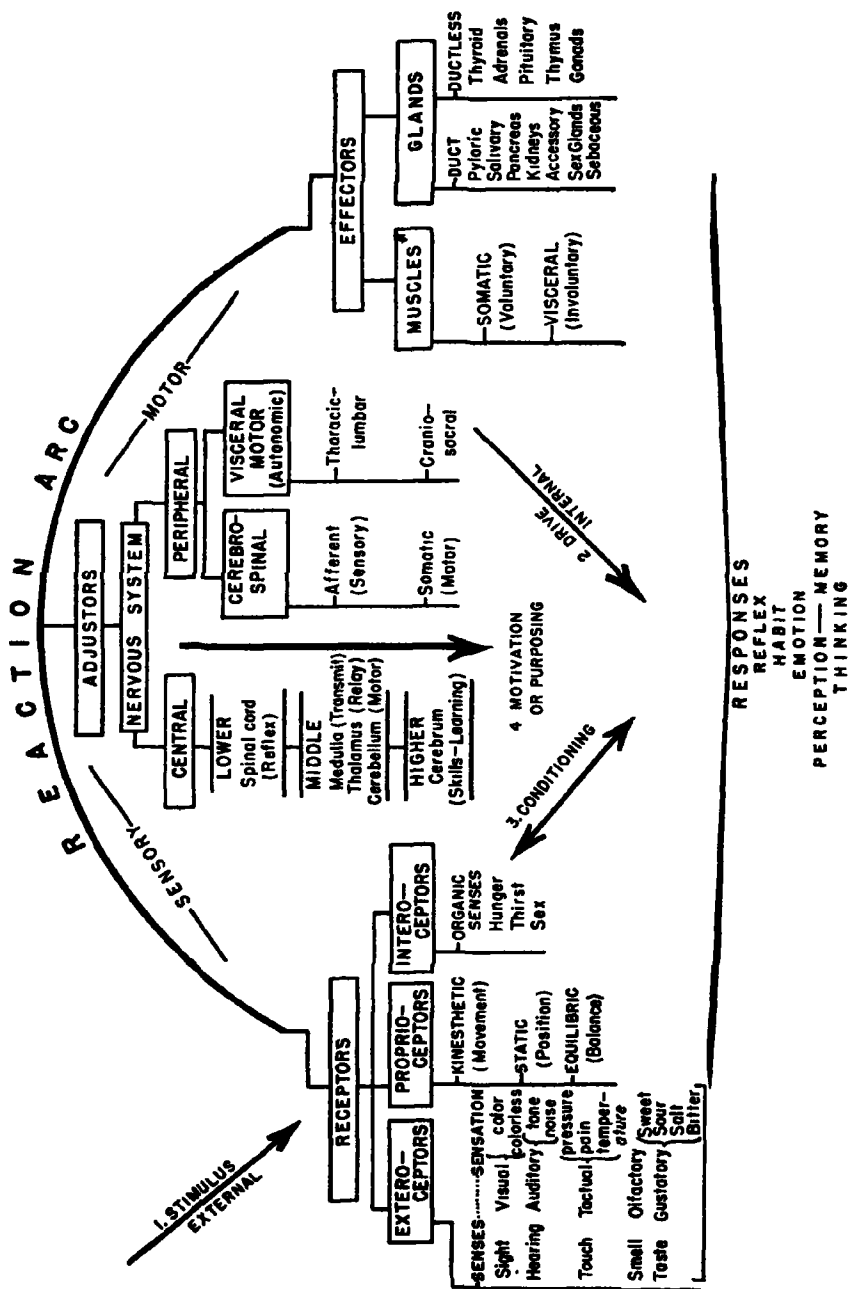


Fig. 6. The reaction arc.

arc, and paths and connectors within the central nervous system, transform incoming impulses into behavior.

The E. symbolizes effectors represented by muscles and glands. They are the organs which receive impulses from the nervous system, described as (A). Effectors yield the response to stimuli characterized by behavior.

The (r) indicates response, variously indicated as behavior, reaction, psychological activity.

The psychological stimulus, it should be remembered, consists of physical impulses in the environment that are capable of producing a physiological change in the receptor organs. Environmental pressures may be external, as in the case of the objects of sense, such as sight factors and changes in the retina of the eye, sound forms and changes in the inner ear. Environmental pressures may be internal, that is to say within the body wall, as, for example, when changes occur in the abdominal region. There are also environmental changes for which no specific receptors exist, and changes outside the range of receptivity, such as X-rays, infra-red waves, ultra-violet waves, auditory vibrations above 25,000 per second.

The accompanying diagram illustrates the reflex arc in the spinal column, and shows the simplest reflex. It represents the progress of a sensation from the skin into a motor act in a nearby muscle. Follow the course of the reflex carefully from the receptor to the effector.

FIVE GROUPS OF RESPONSES

The numerous responses of man may be arranged in five groups which offer a basic classification for human living. These groups are: reflexes, emotional responses, perceptual responses, thinking-reasoning responses, and habit.

1. **Reflexes.** Responses may be characterized as reflex, or physiological pattern reactions when the stimulus and the response are established by heredity. In this case native patterns of behavior are formed, caused by a definite kind of receptor activity. Accordingly, reflex reactions are fundamentally mechanical and basic to both unlearned and learned behavior. Unlearned behavior refers to the ac-

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complishment of those acts that are native to the organism and operate by the force of nature in simple matters like breathing and swallowing.

Reflex actions occur also in learning situations of the higher order of life, as in the varied phenomena called conditioned responses.

2. Emotional Responses. Responses may be characterized as emotional, arising in part from the operation of the brain and lower

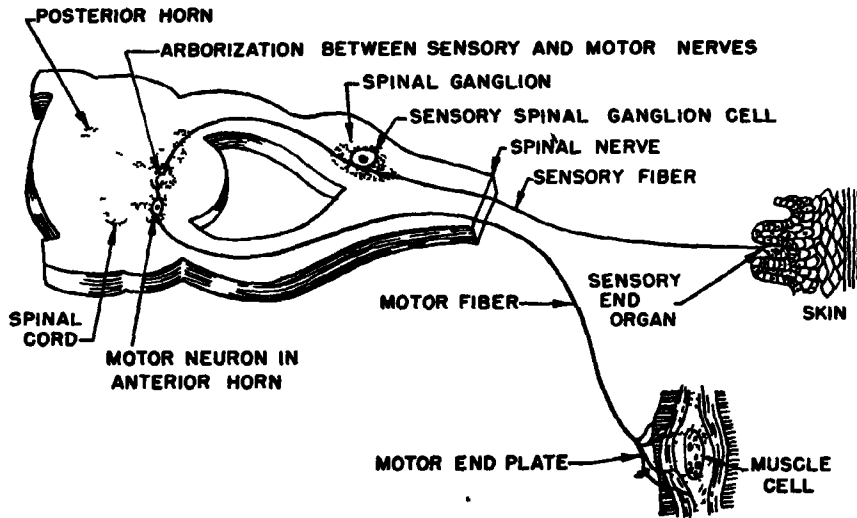


FIG. 7. Reflex arc.

nerve centers, and in part from the awareness of the sensations of these bodily changes.

3. Perceptual Responses. Responses may be characterized as perceptual through the psychological activity of observing, attending, recognizing, discriminating. In this type of reaction interpretation and meaning are given to the data of the senses, depending on the functioning neural arcs.

4. Thinking-Reasoning Responses. Responses may be characterized as organizational when perceptual meanings, consisting of behavior and experience, evolve into ideas occasioning the abilities of thinking and reasoning.

5. Habit. All responses that persist are organized into habits. Some of these habits are physical, as in motor skills, and some are

mental, as in imaging, recalling, thinking. Habits, therefore, represent a total response in which related movements, attitudes, feelings, appear as organized units of behavior.

RESPONSE IN TERMS OF BEHAVIOR AND EXPERIENCE

Confusion of Terminology. In considering responses there are frequent misgivings on the part of the beginning student in psychology. Some words seem to get into each other's way and create unending difficulties. Technically, responses, behavior, and experience are differentiated, but in practical usage these terms are co-ordinate because, in one manner or another, they involve a relationship to three kinds of reactions. These reactions consist of: (1) the organic state of the individual in response; (2) the interrelated activity of the organism and the environment, involving reflexes, initial perceptions, preliminary reactions both physical and psychological; and (3) past experiences disclosed in perceptions, memories, and thinking commonly thought of as experiences.

Behavior and Experience. Behavior, taken separately from experience, represents the arousal of overt responses created within the nervous system, reacting to stimulation and continued in all modes of muscular and glandular activity. Experience, in contrast, is the awareness of the reaction consisting of three groups of activity: (1) It signifies a knowledge of the external world built on the foundation of responses occasioned by the arousal of impulses in the receptors and their neural connectors. (2) It consists of awareness originating from behavior aroused within the muscles and the viscera, that is within the proprioceptors and the interoceptors. In this aspect awareness is basic to feelings of pleasantness and unpleasantness, emotions, and attitudes, with their motor accompaniments. (3) It involves the awareness of events through remembering, imagining, thinking, manifesting the reaction and complex activities of the higher centers, and higher coordinations of the central nervous system.

**SENSITIVITY, SENSE ACTIVITY, AND SENSE
EXPERIENCE**

As in the interpretation of response, behavior, and experience, so here we find ourselves laboring with terms that should be reconciled. These terms—sensibility, sensation, sensitivity, sense activity—when understood better will enable us to appreciate more fully the composition of the response process. A description of these terms follows:

1. **Sensibility.** Sensibility represents the capacity of the physical organism to produce sensation, and to create affection. It indicates that man is capable of responding to the situations of life with suitable sensations emanating from the various forms of stimulation.

2. **Sensation.** Sensations are declared to be immediate awareness coincident with the stimulation of the sense organ. They are conscious reactions to certain forms of neural activity. In this manner a sensation is a basic mental fact, depending on (1) physical stimuli, and (2) a functioning organism, that can be known only in and by experience. Behind it as a mental unit we cannot go. It exists only in being known; when it ceases to be known it ceases to be.

Sensations are known introspectively by their attributes or dimensions. Hence, their quality refers to the unique character of a sensation; intensity refers to the degree or vividness of a sensation; and duration refers to the persistence of a sensation in consciousness. Accordingly, sensations modify experience, they do not constitute the essence of a mental fact which is said to subsist only in the conscious experience of a sensation.

3. **Sense Activity.** The receptors generally contain highly differentiated structures which when active constitute the physical basis of the major responses of common life. These responses we call sight, hearing, smell, taste, touch, and their contiguous sense relations.

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PART TWO

Sense Activity and Sense Experience

The chapters in Part Two deal with exteroception, proprioception, and interoception. **Exteroception** denotes the external senses, the special or specialized senses represented by vision, hearing, taste, and smell. By this sensory means we seek a knowledge of life. **Somesthesia** or the som(a)esthetic senses are represented by every experience not included in sight, sound, taste, smell. Somesthesia is commonly ascribed to the sense of touch which is a relatively unrelated group of sensory qualities or experiences derived from a variety of receptors and tissues, namely, the skin and its contiguous senses in the muscles, tendons, joints, bones, and the internal organs. **Proprioception** deals with the muscular or motor senses giving the experience of movement. It is known by kinesthetic, static, equilibrium, or labyrinthine sense activity. **Interoception** provides man with the basis of feelings, emotions, and sentiments through senses known as organic which are operative in the deep tissues of the body.

ORIENTATION

Eighty per cent of all human reactions are controlled by the eyes, and only the eye that sees well and easily, free from strain, can endure hour after hour of near-point concentration. Seventy per cent of all eyes are said to be faulty. They strain, tire, jump out of focus, and see "double," contributing generously to human waste.

These pages review the structure and physiology of the eye in order to give the mechanical background of the experience of sight. They discuss both normal and defective visual responses. The main phases in the psychology of vision are as follows:

1. Stimulations engage the ciliary and retinal processes. In the

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retinal process impulses are received and transmitted by way of the optic nerve and thalamus to the central terminals.

2. In the cerebral process within the brain the impulses are associated, connected with immediate and past impulses, modified and transformed into visual experience, which through adequate perceiving gives the basis of the ability to know.

3. As a result of these activities (stimulation and cerebation) we interpret visual sense data (colors, grays, size, form), construct our perceptions and develop memories, imaginations, and thinking. This procedure is the foundation of knowledge. So, it is necessary to make proper use of the eyes by developing meanings of objects seen, comprehending with accuracy what we see hourly.

5

Vision: The Experience of Sight

The eye supplies the greatest number of sense qualities, and is usually the most important source of knowledge possessed by man. It is as complex as it is important.

THE MECHANISM OF THE EYE

The eyes are ovoid, almost spherical bodies, slightly less than an inch in diameter, with an outer covering of white substance known as the sclera. They lie in cavities (orbits) in the front of the skull and are embedded in fatty tissues and muscles which provide facility of movement and protection. These tissues and muscles are attached to the orbit of the eye cavity.

The eyeball is divided into two main groups of structures: (1) the lens, iris, and cornea; and (2) the sclera. The lens is a fixed membrane held in place by the iris and the ciliary muscles which regulate its shape and bring the light rays into proper focus.

The iris is a contractile tissue which adjusts the pupil of the eye through which light rays are admitted.

The cornea is a transparent mechanism implanted like a watch crystal in front of the lens and its anterior chamber, which, with the eyelids and the eyebrows, offers protection to the outer structure of the eye.

The sclera is a large posterior opaque sphere, which we know as the white of the eye. It forms five-sixths of the outer coating of the eyeball and functions as a protector for its delicate contents. The sclera and the cornea form the tough outer layers of the eyeball. The choroid, with the iris and ciliary body, supplies the eye with vascular processes giving blood supply, color, and movement to the organ. The choroid itself is a dark-reddish membrane and is composed

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chiefly of blood vessels. In the ciliary region the eye functions through muscular accommodation, which accounts for the curvature of the lens. The iris, the thin muscular diaphragm or shutter, is perforated by a dark hole called the pupil. Two sets of muscle fibers in the iris act as dilators and contractors of the pupil.

The eyeball has three coats or areas. These are (1) the fibrous coating made up of the sclera and the cornea; (2) the vascular area

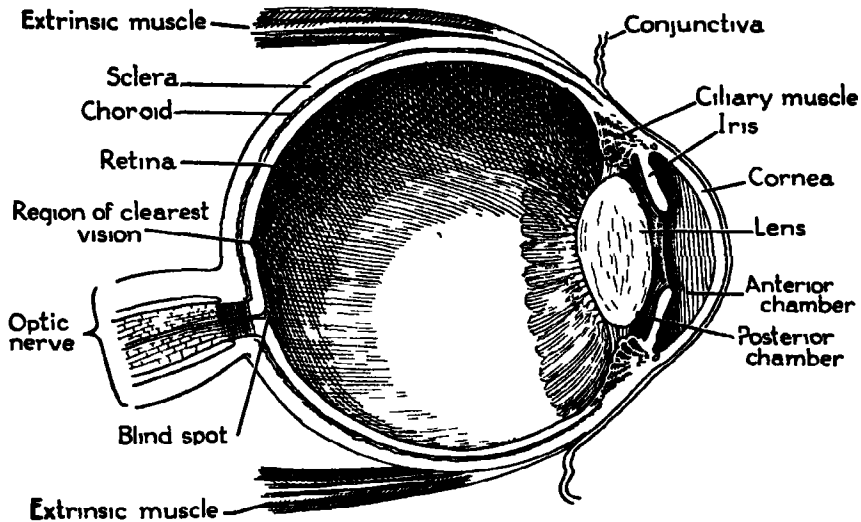


FIG. 8. The eye. (*From* Baillif and Kimmel, *The Human Body in Structure and Function*)

or vessels which include the choroid and the iris; and (3) a nerve coat composed of the retina and its anterior prolongation over the ciliary region. Within these areas lie the refracting structures—the lens, the aqueous humor, and the vitreous humor.

The retina is a delicate membrane of ten layers of tissues and cells, an expansion of the optic nerve, the innermost layer of the eye, and is sensitive to light. In this network of layers are the rods and the cones. The rods function mainly in dim light with no discrimination for colors, and represent night vision when all colors appear to be gray. The cones function best in good light and are capable of color discrimination. In the center of the retina and in a straight line with the pupil of the eye is a yellowish section known as the macula

lutea in which is located the fovea centralis, containing numerous cones responsible for full or maximum vision. The fibers of the optic nerve are distributed over the retinal area and carry the visual stimuli to the optic lobe of the brain.

Neural impulses are transmitted from the rods and cones to the bipolar cells or nerve cells with two projecting fibers, one of which conducts the impulse toward the cell body, the other away from it.

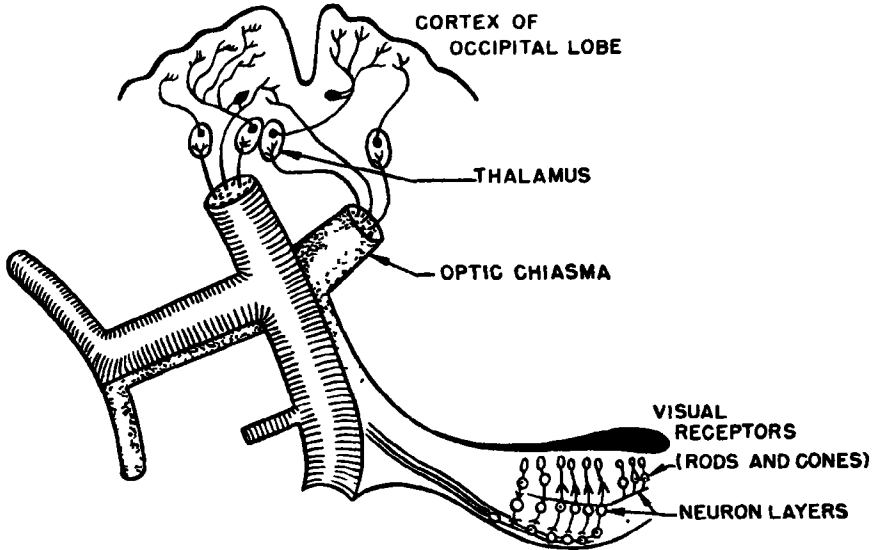


FIG. 9. Pathways of neural impulses from the eye.

From the bipolar cells the impulse proceeds to the optic nerve cells where axons leave the eye within the optic nerve. Neurons connect adjacent areas of the retina, and the optic nerve leaves the retina at what is called the blind spot. Here there are no rods and cones, as the name blind spot indicates, and there is no sensitivity to light. (Fig. 10.)

The optic nerves from the two eyes cross at the optic chiasma, as illustrated in the preceding figure, where the optic fibers are redistributed, those from the left side of both eyes going to the left side of the brain, and those from the right side of the eyes proceeding to the right side of the brain. The optic fibers terminate in the thalamus, which is a center for certain automatic controls and re-

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direction of impulses. At the thalamus, sensory paths make synaptic connections with new fibers and carry the impulse to the visual cortex in the occipital lobes of the cerebrum. Only when visual impulses from the retina reach the visual cortex does the sensitivity we know as sight occur. Damage to any part of this area results in blindness.

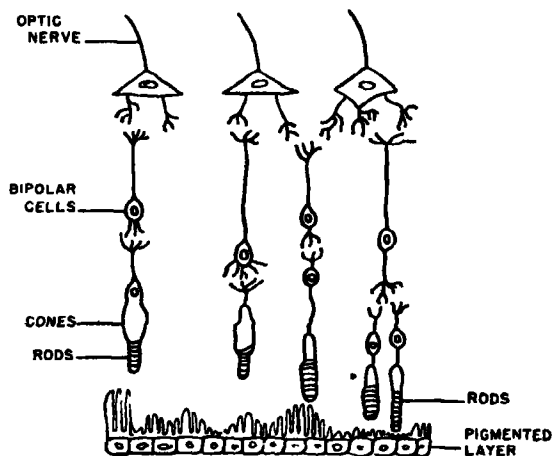


FIG. 10. Section of the retina.

The muscles of the eyeball are six in number—four recti and two oblique. Their combined action enables the eyes to be turned in the different directions required for normal sight. The oculomotor muscles are attached externally to the sclera of the eye and to the bony orbit which contains the eyeball. Their joint action permits the individual to fixate the same object with both eyes, and allows the eyes to turn in any direction. The superior rectus muscle turns the eyes upward. The inferior rectus turns the eyes downward and works antagonistically to the superior rectus. The external rectus rotates the eyes outward, and the internal rectus rotates the eyes inward. The two muscles that turn the eyes diagonally or obliquely in their sockets are the superior oblique and the inferior oblique. The mechanism of accommodation is resident in the lens and ciliary muscles.

The blood supply of the eye is received from the ophthalmic artery. The transparent parts of the eye: the cornea, the lens, the

humors, and the retina, have no blood vessels. They receive their nourishment from the lymph spaces. The third, fourth, and fifth cranial nerves furnish motor current, and the second nerve, the optic cranial nerve, is responsible for the sight impulse. The eyebrows and eyelids serve as eye protectors. The lacrimal gland, situated in the depression inside the orbit, secretes tears which are discharged through a number of ducts into the conjunctiva, a thin epithelial membrane which covers the eyeball. This gland serves as a reservoir for tears, the function of which is to moisten, lubricate, cleanse, and protect the eye. A nasal duct runs from the lacrimal sac into the nose and carries off excess moisture or tears.

HOW THE EYE FUNCTIONS

The human eye is comparable to a camera. The lens is represented by the refracting media of the eye; the dark space of the camera is analogous to the space within the choroid. The sensitive film may be compared with the retina, the shutter with the iris, the aperture of the camera with the pupil. Light waves fall on the cornea and are focused in the pupil and the lens. Objects near-by, or far-away, engage the action of the ciliary muscles and the iris. The shape of the lens is adjusted to the needs of the stimuli, and the light waves are ready for adaptation in the retina. When a visual object stimulates the retina, the optic nerve with its collateral fibers becomes sensitive, and impulses are carried to the brain for perceptual or meaningful response.

VISUAL EXPERIENCE

Vision is man's most precious possession. In normal behavior it is responsible for the largest variety of ideas, without it life is always handicapped. Vision helps us to know our world by seeing. We shall discuss this phase of vision more thoroughly later (Chapter 11). Meantime it is necessary to recognize the importance of visual acuity, or the capacity of the visual sense organ to distinguish sensory impressions in the world about us. This ability is gained by effective vision which sees objects clearly.

DEFECTS OF VISUAL ACUITY

When vision is not clear the ordinary defects consist of two groups, known as errors of refraction and disturbances of the six extrinsic muscles.

ERRORS OF REFRACTION

Errors of refraction, or ametropia, represent a condition of the eye in which the refracting powers are not adjusted to the position of the retina. The ametropias are therefore traceable to defects in the shape of the eyeball, lens, or cornea, and include myopia, hyperopia, and astigmatism.

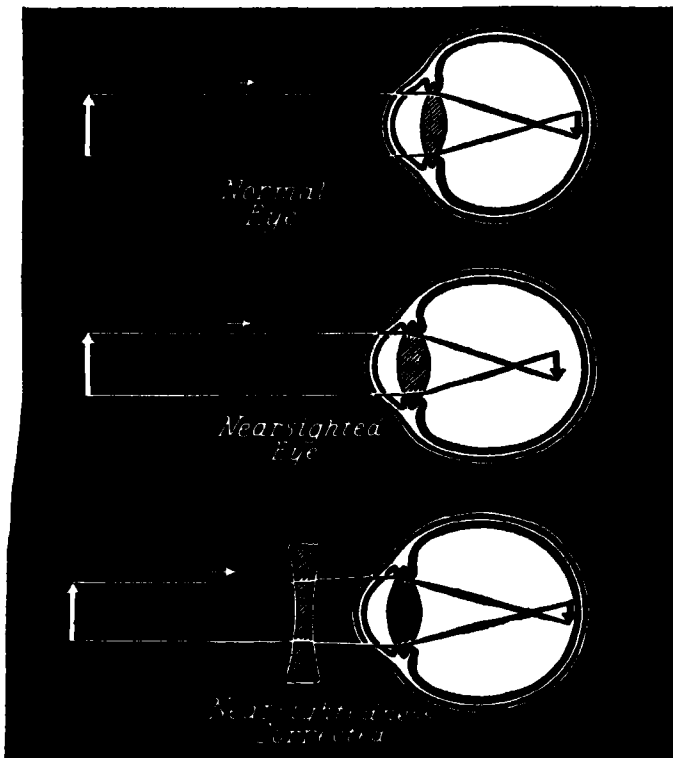


FIG. 11. The near-sighted eye and its correction. (*From* Carleton and Williams, *Physics for the New Age*, J. B. Lippincott Company, Publishers)

Myopia, or near- or short-sightedness, is caused by an elongated eyeball, which makes the anterior-posterior diameter of the eye too long. Rays of light are converged or brought to a focus before they reach the retina. They cross at a point in front of the retinal surface as indicated in the accompanying illustration (Fig. 11).

Hyperopia, or far- or long-sightedness, is commonly caused by a shortened eyeball in which the rays of light focus at a point back of the retina. The rays are brought to a focus imperfectly on the retina causing blurred vision (Fig. 12).

Astigmatism is a common defect of vision. It usually accompanies myopia and hyperopia, and complicates both defects. Astigmatism

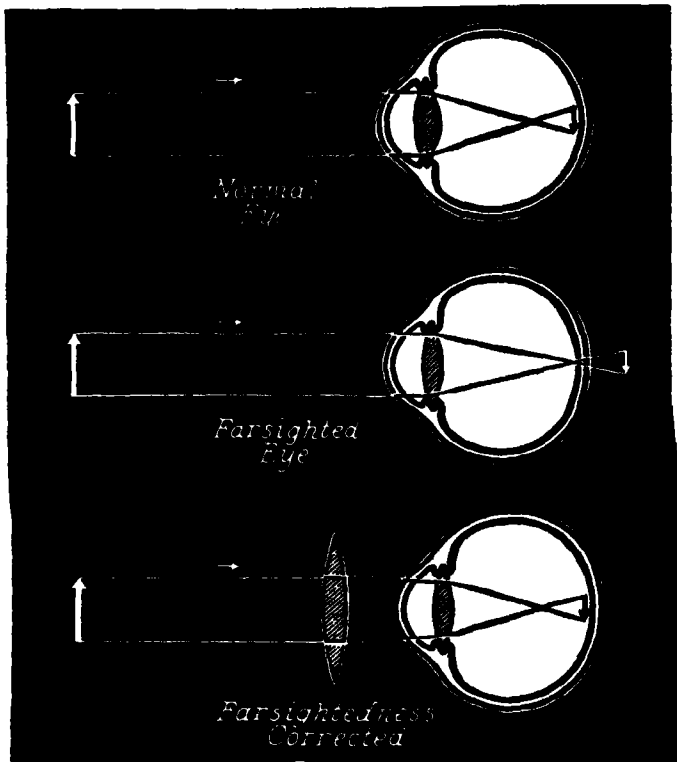


FIG. 12. The far-sighted eye and its correction. (From Carleton and Williams, *Physics for the New Age*, J. B. Lippincott Company, Publishers)

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is usually caused by unequal curvatures along the different meridians of the cornea and the lens. The rays of light in all the meridians, formed by the intersection of the surface of the cornea, are not perfectly focused but converge at different points. Similar inequalities in the anterior and posterior surfaces of the lens may contribute to the defect. When the curvature is greater along one axis than another the refractive medium becomes ellipsoidal and involves the eye in double focus.

Do the lines of the following chart appear to be equally black viewed from an arm's length distance in an upright position? If they do not there is indication of astigmatic defect.

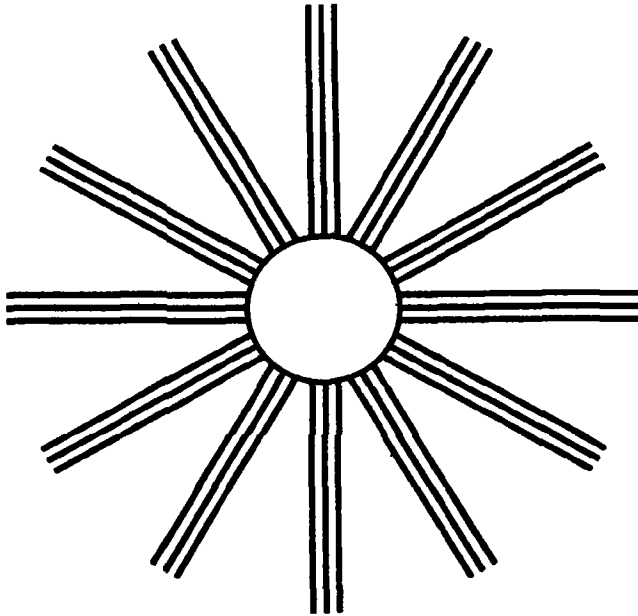


FIG. 13. Test for astigmatism.

MUSCULAR DEFECTS OF THE EYE

Disturbances of the six extrinsic muscles attached to the eyeball produce insufficiencies in the muscular functions of the eye, muscular imbalance, asymmetries of eye movements, and in extreme cases

squint or cross-eye, strabismus (heterotropia). These muscular defects appear to be caused more frequently by errors of refraction rather than by contraction, relaxation or paralysis. They interfere with the normal functioning of the oculomotor muscles.

Strabismus. Strabismus, or squint, usually results from congenital and excessive ametropic errors, such as hyperopia in one eye. It has two frequent forms: **Esotropia**, or cross-eye, an internal condition in which the visual axes converge, and **exotropia**, an internal condition in which the axes diverge. Convergent squint is often associated with hyperopia. Divergent squint is frequent in myopia. Pronounced squint or heterotropia produces double vision or diplopia.

COLOR VISION

Visual Stimulation. The physical stimulus for vision is light which occurs by ether vibrations or light rays, sometimes called light waves, which travel at a rate of about 186,000 miles per second. Wave-lengths vary for color sensitivities, ranging from about 760 μ (millimicron) for red, and decreasing through orange, yellow, green-blue, to 390 μ for violet.¹

Color Sensations. There are two kinds of visual experiences: chromatic and achromatic sensations. The chromatic are the color series consisting of some 40,000 different sensations arranged in three quality series, namely: brightness, saturation, and color tone or hue. The achromatic are the colorless sensations or the numerous degrees of the white-gray-black series.

The normal person possesses qualities which enable him to recognize colors by discrimination in brightness, saturation, and hue. The brightness of a color depends on the intensity and magnitude of the sensation and is illustrated by the fact that yellow is brighter than blue. Yellow has more intensity of visual stimulus, a greater amount of energy in its lightness determined by the amplitude or height of the light waves. Accordingly, brightness depends on the physical intensity of the visual stimulus, or the amount of energy that comes to the eye. The saturation of a color represents color purity, or the

¹ See Dictionary of Psychology, edited by Howard C. Warren, Boston: Houghton Mifflin, 1934, p. 316.

maximum degree of color pigment possessed by the color. It depends on the amount of hue that is present and the absence of white-gray-black. If a saturated color is mixed with white, gray, or black, both saturation and brightness are decreased. Color tones, or hue, range from red, which represents the longest wave-length, through the colors known as orange, yellow, green, blue, to purple, which represents the shortest wave-length. Color tones include all possible colors and their combinations.

Primary Colors. Most psychologists regard blue, red, green, and yellow as primary or fundamental colors from which all other hues are derived. Orange, for instance, is a mixture of red and yellow, and purple a combination of blue and red. It is claimed by experimental psychologists that there are some 35,000 visual sensitivities, 160 of which are distinguishable hues, and 600 distinguishable brightnesses.

Color mixture in psychology is regarded as a fusion of light, not of pigments. It is a phenomenon that takes place in the retinal process, rather than in the objective stimulus. Accordingly, the phenomenon is due to the positive after-image overlapping the stimulus of the color that immediately succeeds it when the colors are mixed on a revolving wheel. Two classes of color phenomena result from the mixing, namely: blends and grays. Blends resemble both components and are produced from non-complementary colors, as orange is a blend of red and yellow, and purple a blend of red and blue. Grays, as a comparison, are produced by mixing complementary colors. Differences in the intensity of light are most important in distinguishing the appearance of colors. Blue and green, for example, appear to be brightest in a faint light. Yellow and green are brightest in a strong light. In a dim light some colors fade into gray quickly.

Color Zones in the Retina. The sensitivity for color is situated in the cones of the retina. Rods are scattered throughout the retinal zone but the cones are not. Hence, the retina is not equally sensitive over its entire area, and colors, shapes, and forms are best perceived in the fovea. At the outer edges of the retina only black, white, and intermediate grays are visible.

The measurement of color sensitivity is effected by means of an instrument known as a perimeter. By its use colors are passed over a semi-circular arc with the eye fixated on a central spot. As the color

stimulus comes into the field of vision the sensitivity is noted, making it possible to map out the color zones. Such experimentation discloses that true color is always visible in the fovea area, with blue and yellow visible in the intermediate zones, and all colors appearing as grays in the outermost zone. When a color is moved by means of the

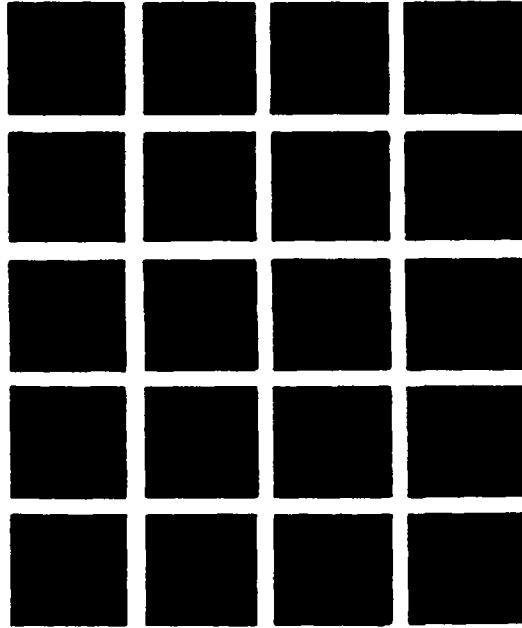


FIG. 14. Brightness contrast. Note the gray dots which appear at the intersections.

perimeter from the center of vision to its periphery, a change in its hue is noted. A green stimulus, for example, gradually loses its greenness, becomes yellow and then gray. Red changes through yellow to gray, blue and yellow are visible throughout the middle zone, changing to gray without transition to another color.

Brightness, saturation, and size of the image necessarily vary in the retinal zones, but the color zones remain separate for the specific color stimuli.

The After-image. After-images or after-sensation, caused by activity of the nerve cells in the retina after the stimulus has been removed, are of two kinds: positive and negative.

Positive after-images appear immediately after the removal of the stimulus and continue briefly. A positive after-image of an ordinary electric light is bright, and its color persists as the same hue. In the positive after-image the colors may fade out slowly, giving a "flight of colors" rainbow-like, passing from one to the other.

Negative after-images appear a few seconds after the stimulus has been removed, and continue for varying lengths of time. Unlike positive after-images, which are usually quick and brief, the negative after-image is occasioned by a relatively long stimulation from a less intense object. The negative after-image of a light sensation is a dark sensation; in the color series it appears in its complementary hue. Its duration depends on the intensity of the stimulus, the duration of the stimulus as perceived, and the determining physical and mental attitude of the individual concerned.

Visual Adaptation. It is an important characteristic of the retina that it adapts itself to the changes in quality, intensity, and degrees of illumination. This physical reaction is an important psychological product since it is necessary for man to adapt himself to light as in daylight, to darkness as at night, and to color as we experience it. Without this function human life would meet considerable confusion. Human adaptation to light is rapid, to darkness relatively slow, and to color by perceptual ability and habit.

Visual Contrast. A remarkable fact in color vision is contrast. By it colors gain a useful value in any human situation. It can be ascertained best by a simple experiment with colors. If you place a gray spot on a red background you will find the gray becomes tinged with blue-green color. If you place the gray spot on a white background, and the same kind of gray on a black background the gray on a white background will appear darker than the gray on the black background. This principle is very useful in decorations, dressing, painting, and other human activities.

In the case of complementary colors, meaning any pair of colors mixed on a revolving color wheel in proper proportions to give a sensation of gray or white, color contrast is even more striking. Each complementary color is enhanced by contrast, appearing to be more saturated because of the stimulus of the other. Thus red and green, being complementary or antagonistic colors, when shown together present more saturation, and in practical usage one appears to oppose

the other, as an automobile plate with red figures on a green background or vice versa.

THEORIES OF COLOR VISION

Three historic theories have been proposed to explain color vision. No one seems conclusive but each has its merits and its followers.

1. **The Young-Helmholtz Theory.** This theory was originally proposed by Thomas Young in 1801 and elaborated by the famous physicist Helmholtz in 1859. Helmholtz held there are but three primary colors: red, green, and blue or violet. Any two of these primary colors when stimulated simultaneously give rise by combination to those colors intermediate between them in the spectrum; red and green give yellow, green and blue give a greenish blue; red and blue give purple. For these primary colors, the theory holds, there are three sets of cones in the retina. The equal stimulation of these cones gives white. The stimulation of complementary pairs of primary colors gives gray or whites. Color results, therefore, in unequal stimulation of these cone structures, and the absence of stimulation results in black, while retinal fatigue is responsible for negative after-images.

2. **The Hering Theory.** This theory, proposed in 1888, is considerably favored by physiologists. Hering insisted there are four primary colors—red, green, yellow, blue, and that they are combined in pairs of receptive processes, or end organs, within the retina. Each of the pair is produced by an opposite reaction of the retinal structure. Red is produced when the red-green retinal organism breaks down by undergoing katabolism, that is when the neural energy is reduced; green is produced by the reverse process, that is when the same organ undergoes anabolism and the neural energy is increasing yellow appears when the yellow-blue organism is in katabolism, and blue is produced when the same organism is built up, that is, when anabolism occurs. For the white-black series a third retinal organism was added that responds by the building up-breaking down process, as in the former instances. When the organism is built up white appears, when it breaks down black arises. When red and green are equally strong then their effects on the red-green organism are equally strong and one cancels the other and we see gray.

3. The Ladd-Franklin Theory. This theory came into existence in more recent years, in 1929, and recognizes the principles of biologic evolution. It proposes that retinal structures have been modified in the evolutionary history of man. The earliest of the phylogenetic activities produced white and grays, yielding as time proceeded, yellow sensitivity from long waves and blue sensitivity from short waves. With the course of evolution yellow broke down into red responding to long waves, and green responding to waves of medium length.

COLOR DEFICIENCIES

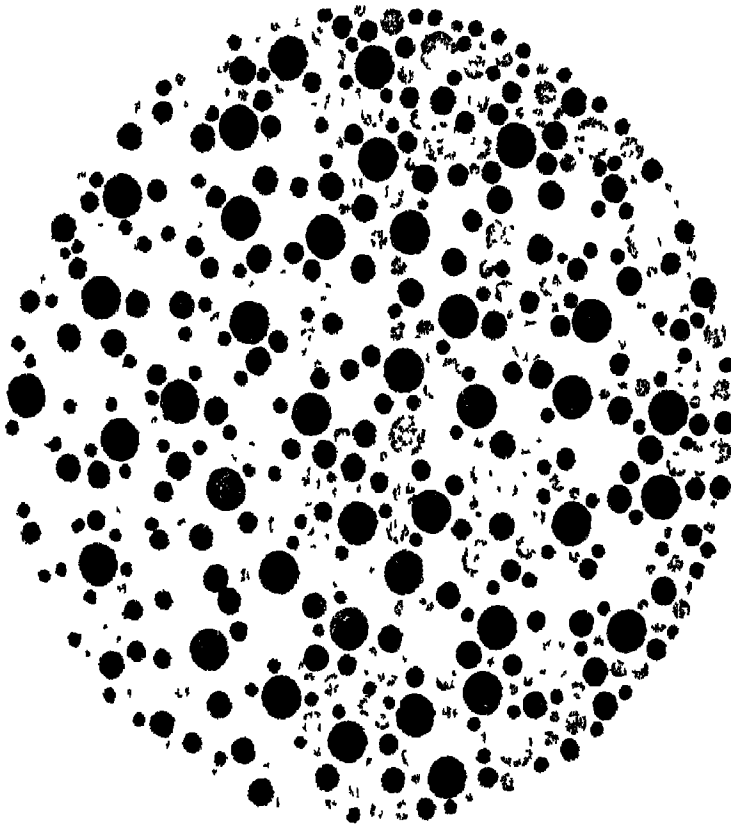
Color weakness and color blindness exist in many people, due to inefficiencies of the retinal cone receptors. They are mostly inherited and incurable. It is a plain fact that not all persons see colors equally well, which indicates the possibility of color weakness. The following are the chief color deficiencies.

1. Red-green Blindness. The most common form of color blindness is the red-green type. It is present approximately in four to eight per cent of men, and is much less common in women. This type of color blindness is frequently spoken of as partial color blindness. In this deficiency the only colors that are distinguishable are yellows and blues and their combinations. Faint reds and greens are especially confusing.

Two sub-types of red-green blindness are recognized, namely: protanopia and deuteranopia. Protanopia is the commoner form, and the individual involved is called red blind because he confuses red, yellow, and green, which for him differ only in intensity. Deuteranopia is green blindness, which is less common than the former, and the individual likewise confuses red, yellow, and green. Both of these sub-types are indicated because of the difficulty some people show in distinguishing reds and greens accurately.

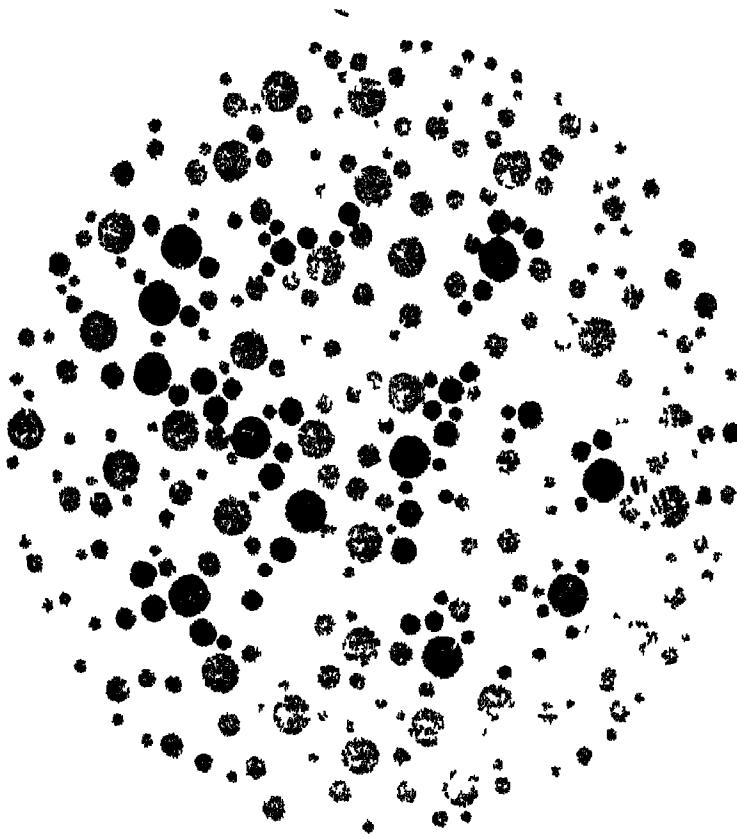
2. Blue Blindness. Blue blindness, or Tritanopia, is rare, and is often regarded as uncertain.

3. Total Color Blindness. There are people who distinguish no colors at all, only grays. Landscapes and pictures are uncolored. They are unable to distinguish all hues and evidently lack the necessary cones in the retina. The totally color blind eye usually is capable



Subjects with normal vision see the number "28."
Color-blind persons see only a mass of dots.

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THE DVORINE COLOR PERCEPTION TESTING AND TRAINING CHARTS



Subjects with normal vision see the number "56."
Color-blind persons see only a mass of dots.

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of distinguishing differences in brightness. It may see blue as bright or brighter than another color, hence it may be assumed that the rods play a contributory role in color discrimination. Thus, it has been theoretically asserted that the cones function for color sensitivity and the rods for brightness and faint lights.

4. **Color Weakness.** Color weak persons are more common than the total or partially color blind. They are troubled with discrimination of pinks, light greens, light blues, but they have little or no difficulty with brightness stimuli, which probably accounts for relative efficiencies in observing traffic lights.

A PARTIAL TEST FOR COLOR BLINDNESS

The Ishihara Color Plates. Dr. Shinobu Ishihara, a Japanese professor, has invented color plates for the detection of color blindness.

The Dvorine Color Perception Testing Charts. Dr. Israel Dvorine has perfected a series of charts for testing color perception. Two of these are reproduced. Before submitting yourself to the reading of these color plates note that it is generally agreed that one man out of 25 is color blind, and one woman out of 250 is color blind. In the most common types the individual cannot distinguish between the complementary colors red and green, but usually sees blue and yellow perfectly well. Total color blindness in which no colors are distinguishable is very rare.

VISUAL SENSE PERCEPTION

The normal functioning of the eye results in adequate visual sense perception, which is responsible, in part, for the experiences of space so important in the interpretation of human life. How, then, do we know the world we see?

THE VISUAL BASIS OF FORM IN SPACE EXPERIENCE

The forms of objects in space are perceived by the projection of images on the retina which become meaningful in human experience.

They depend on the characteristics of the stimulus and its environment, on distances involved, and on the size of the retinal image. To interpret objects in space there are certain primary space criteria and more secondary space criteria.

Primary Space Criteria. Visual space perception is the facility for making interpretations of objects in their location and distance by means of sensory cues which operate within the receptor process, hence for seeing objects in space the primary criteria depend upon the structure and functioning of the eyes. These criteria are binocular parallax, accommodation, and convergence.

A. BINOCULAR PARALLAX. The images on the two retinas are different because of unequal observation by each eye. Hold a pencil at arm's length. Close one eye and look at the pencil with the other, then change the procedure with the other eye closed. Note the different views you get with each eye of the pencil held in a static position. Now hold the pencil a foot from the eye, alternating the vision as before and note the difference. The amount of differences between the two views, or the degree of doubleness, is a cue to the distance. Efficiency in this function gives **depth perception** which is important in gauging distances. It is very definitely needed in the accurate observation of approaching objects, such as automobiles on the highway.

B. ACCOMMODATION. The muscular strain in seeing an object demands a change in the shape of the lens of the eye so that the image will be focused exactly on the retina. Hence focusing, or accommodation, is accomplished by a change in the curvature of the lens. The curvature decreases for distant objects and increases for objects near, due to muscular effort. At short range a slight change in the distance of the object inspected necessitates a change in accommodation. For objects at long range accommodation changes are slight. The result of proper accommodation in seeing is exactness in the focus of the image on the retina.

C. CONVERGENCE. The facts of parallax—the apparent relative movement of objects at different distances when the eye shifts its position laterally, and of accommodation for near things—call for convergence, particularly in the case of small objects. Muscular tensions on the eyeballs compel the images of the objects to fall on corresponding points on the two retinas, so that the object is seen as

single. If the objects fall on retinal points that do not correspond, then the separate images produce double vision.

These three perceptual cues—parallax, accommodation, and convergence—are fundamental in the development of accurate perception. There are other cues, less important, which should be added as secondary criteria.

Secondary Space Criteria. The secondary criteria of space perception are more distinctly psychological and supplement the primary criteria. The more important are as follows:

A. LINEAR PERSPECTIVE. When you look down railroad tracks they appear to converge but in physical fact we know this is not so. The same observation may be noted in looking down a long corridor. The walls at the far end appear to be closer than where we stand some distance away. The converging of the railroad tracks or the long corridor is a sign or cue of increasing distance because this is an actual retinal fact in viewing such a scene. There is a correspondence between objects viewed with increasing distance and the decreasing size of the retinal image. This psychological factor, called linear perspective, is a supplementary basis for the experience of depth. The accompanying illustration shows the phenomenon of linear perspective.

B. AERIAL PERSPECTIVE. Why do objects appear to be far away when they are actually near in dusty, foggy, or smoky atmosphere? A ship, for instance, when seen through a fog or mist, may be nearer than it appears to be. On a clear day distant objects look near; on a hazy day distant hills are recognized in faintest outline only. Artists make good use of this fact by blurring the background to convey the intended space meaning. Aerial perspective, then, is another way of conveying the perception of depth and related factors in space judgment. A hill or mountain, wedged between two hills that meet in the foreground, when seen as dull or obscure, appears to be far away, whereas in a situation with the mountain in sharp outline snuggling between hills in the foreground it seems to be near.

C. CHIAROSCURO, OR LIGHT AND SHADE. Light is interpreted as nearer the observer and shade as farther away, as illustrated in the following picture of a natural bridge photographed in the Rocky Mountains. The obscurity of the dark and the sharpness of outline

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for the lighter portion of the picture also demonstrate aerial perspective.

The differences in the perceptive reaction are dependent on the depth relation and the direction of the illumination, and the facts of space judgment in this scene are occasioned by the area of bright illumination.

D. INTERVENTION, OR INTERPOSITION. Objects interposing on one another or others give depth to a scene that would otherwise be flat. Near objects conceal parts of objects not in the foreground. The accompanying illustration shows a car, a cannon, a flagpole, and a lady and boy interposing a gateway.

Similar factors in the perception of space are seen in **angular perspective**, where, for example, flat surfaces, such as table tops when viewed from the front, give vanishing angles and produce definite depth effects. Lines of objects viewed in certain angles are likewise shortened in perspective.

It will be seen in a later discussion on perception that visual sense activity is supplemented by auditory, tactual, kinesthetic, and other sense cues. Ordinarily we use more than one sense to gain our knowledge of the segments of human experience. The perception of form, with its allies shape and number, for instance, do not depend wholly on the fact of retinal images. Actually the visual sense depends on its own and related sense activity, on the perceptual processes involved, and on habits acquired from previous experience.

ILLUSIONS

Some elements in a given experience do not conform with sensory facts, or they are misinterpreted, and as a consequence are called illusions. They occur in normal experiences as erroneous perceptions because only certain parts of sense data are perceived with approximate accuracy, while other sensory data are ignored and some added.

Some Visual Illusions. Test the accuracy of your eyes for what you actually see by observing the following figures.²

² Reproduced from "Popular Psychology Guide," April, 1941, pp. 34-35. By permission of the publishers.



Linear perspective.



Aerial perspective.



Chiaroscuro, or light and shade.



Intervention, or interposition.

Illusions Based on Wholes. Some visual illusions are based on the tendency to perceive wholes rather than parts. This judgment is typical of the parallelogram illusion illustrated in the previous examples; it is true of the contrast illusion shown by the circles. The Müller-Lyer illusion is the classic illustration of illusions based on wholes or the entire figure or object. It is shown in the following drawing where the horizontal line is divided in equal parts by the vertex of the middle angle. The observer is "fooled," partly because he does not restrict his attention to the specific parts to be compared.

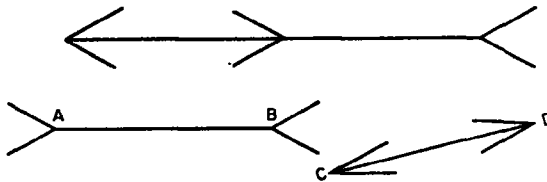


FIG. 15. Examples of the Müller-Lyer illusion.

Illusions by Surroundings. Visual illusions are based also on effects produced by surroundings. The Poggendorf illusion shown in two of the accompanying illustrations gives evidence of this fact. Is the line (a) continued as line (b) or (c)? The Zollner illusion is a further example of illusion by surroundings. Are the vertical lines parallel or do they converge? They appear to converge but actually do not.

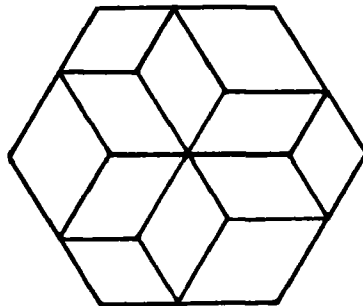


FIG. 16. How many designs can you see? There are four in this illustration.

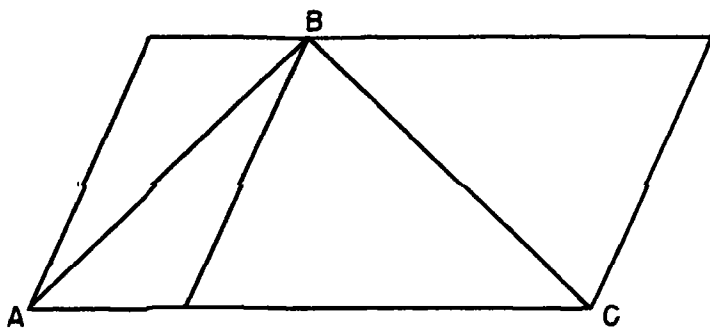


FIG. 17. Is AB as long as BC ?

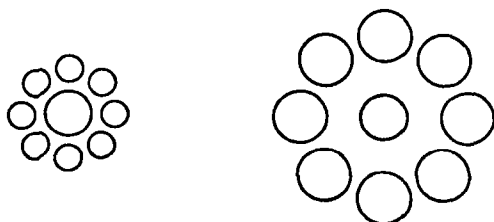


FIG. 18. Are the inside circles the same size?

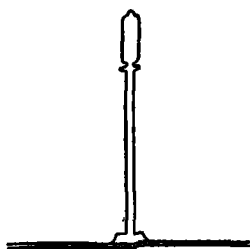


FIG. 19. Is the sidewalk or the lamp-post longer?

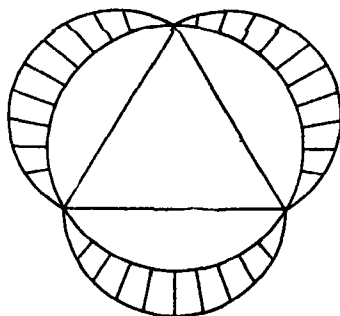


FIG. 20. Is the inner circle a perfect circle?

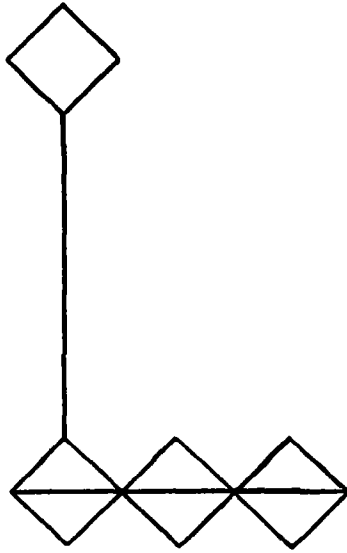


FIG. 21. Is the horizontal or vertical straight line longer?

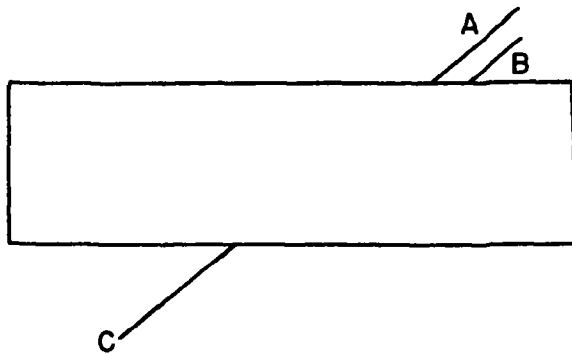


FIG. 22. Is *C* in line with *A* or *B*? (The Poggendorf illusion)

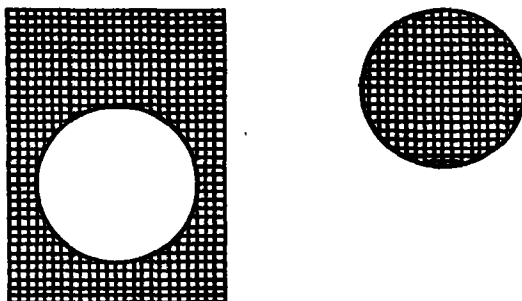


FIG. 23. Which circle is larger?

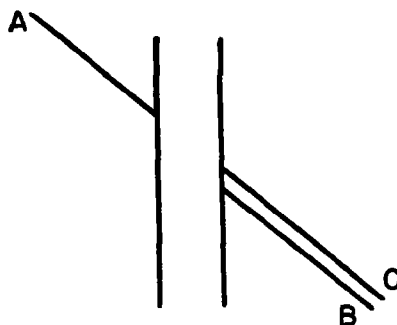
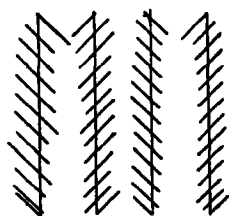
FIG. 24. Is *A* in line with *B* or *C*? (The Poggendorf illusion)

FIG. 25. The Zollner illusion.



FIG. 26. Are the letters the same width?



FIG. 27. Are the
top and bottom
the same width?

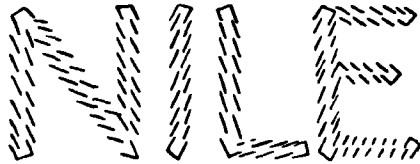


FIG. 28. Do the letters slant?

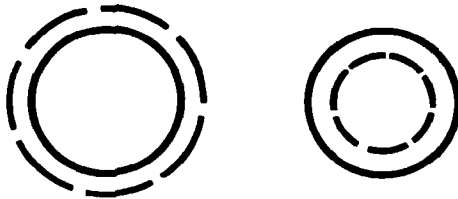


FIG. 29. Are the two solid circles the
same size?

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ORIENTATION

Next to vision the most important human sense is hearing. In many activities it is more important than vision since so much of everyday life is guided and sometimes controlled by sounds. Sounds are manifold. They range from big annoying noises to slight non-irritating sounds. The human voice is sound; voices must be identified. Music is sound; it is a language that should be interpreted.

Hearing, like vision, apart from its technical construction, gives background to psychological efficiency. It is estimated there are approximately 15 million Americans with impaired hearing.

The chapter discusses :

I. The Mechanism of Hearing.

- A. The outer ear: (1) pinna; (2) concha; (3) meatus.
- B. The middle ear: (1) malleus; (2) incus; (3) stapes.
- C. The inner ear: (1) vestibule; (2) saccule and utricle; (3) cochlea.

II. Physiological Action in Hearing.

III. Psychology of Hearing.

- A. Sensory data of audition: (1) sounds: (a) tones, (b) noises.
- B. Pure tones: (1) pitch; (2) intensity; (3) duration.
- C. Complex tones: (1) partials; (2) fundamentals; (3) overtones.
- D. Timbre.
- E. Noise.

IV. Auditory Sense Perception.

- A. Sound location.

V. Auditory Disorders.

- A. Deafness and mental life.
- B. Language inadequacy.
- C. Organic auditory disorders: (1) anacusia; (2) tinnitus aurium; (3) otitis media.
- D. Functional auditory disorders: (1) psychological deafness; (2) subjective sounds.

6

Audition: The Experience of Sound

Hearing is a vital human experience. Normal life demands good hearing. It results from the interaction of sound waves and the sound mechanisms of the ear. Sound waves are generated by vibrating bodies and are carried to the ear by molecular motion. The psychology of hearing co-ordinates three fundamental factors: (1) the vibratory action of sounding bodies; (2) the nature of the hearing mechanism in the ear and the nervous system; and (3) the sense factors in sound or sound experience.

THE MECHANISM OF HEARING

The auditory apparatus is divided into three major parts: the outer ear, the middle ear, and the inner ear.

The outer ear consists of the external shell (pinna, concha), and the external tube (meatus), which passes through an opening in the skull and terminates in the ear drum (tympanum), the vibrating mechanism at the end of the external mechanism.

The middle ear is an extension of the outer ear. This anatomic section consists of three tiny bones called the ossicles: (1) THE MALLEUS, shaped like a hammer, with the head resting on another bone called (2) THE INCUS, which resembles a small anvil. One leg of the anvil is fastened to a third bone called (3) THE STAPES, resembling a saddle stirrup. The broad part of the stirrup between the arch rests its prong on a membrane that gives the form of an oval window opening into the structure beyond. The three ossicles are popularly known as the hammer, anvil, and stirrup, which are the English equivalents of the Latin words malleus, incus, and stapes, used above.

The middle ear occupies the upper section of the eustachian tube which opens into the back of the mouth. The eustachian tube is a

necessary air cavity or chamber which enables the air pressure in the middle ear to be equal to that of the external ear. The function of the middle ear is to carry the molecular vibrations that have entered the outer ear to the deeply embedded or inner auditory structures.

The inner ear, or labyrinth, is a very complicated membrane serving the needs not only of hearing, but also of bodily equilibrium and balance, and the static senses which operate through the semicircular canals. The auditory portion of the inner ear consists of: (1) a cavity called the vestibule, which is formed by two circular-shaped structures known as the saccule and the utricle; and (2) a spiral or snail-shaped body called the cochlea. In the cochlea is located the basilar membrane and a series of rods and air cells called the organ of Corti. These structures connect the fibers of the auditory nerve and are probably the actual seat of the sense of hearing.

PHYSIOLOGICAL ACTION IN HEARING

Sound waves (molecular vibrations) are taken through the mechanism of the external ear and proceed to the ear drum, which sets in

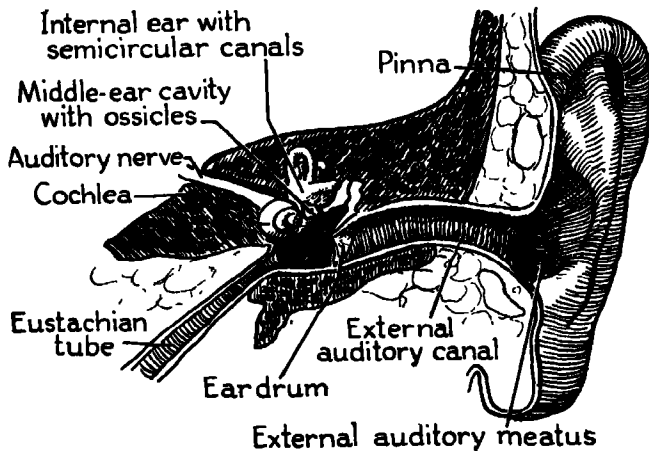


FIG. 30. Parts of the ear. (*From Baillif and Kimmel, Structure and Function of the Human Body*)

motion the ossicles of the middle ear (the malleus, incus, and stapes). These ossicles bring the oval window into function, conveying the

sound waves to the cochlea by mechanical vibrations. The basilar membrane and organs of Corti are thus stimulated and the impulse is carried by the nerve fibers to the brain centers.

Sound has varied speeds for different conditions and circumstances. In air, sound proceeds at the rate of 1090 feet per second; in water, at 40° C., 4674 feet per second. The velocity of sound through a metal, such as steel, is given at 16,500 feet per second.

The normal ear is capable of receiving sounds from 16 to about 20,000 or 30,000 d.v. (double variations) a second.¹ Individuals vary greatly in hearing ability; some are normal, others are slightly deaf, others hard-of-hearing, and some are very deaf. It is estimated there are 15 million Americans with impaired hearing.

THE PSYCHOLOGY OF HEARING

The Sensory Data of Audition. The most important psychological characteristics of sound experience are tone, pitch, timbre, chords, and noise. These sound factors proceed from the human voice, music, and nature.

The fundamental data of hearing are sounds which consist of pure tones, complex tones, and noises. For the practical purposes of life these data are reducible to tones and noises. Tones are rhythmic, combinations of simple or pure tones of different pitches, producing satisfying helpful sounds. Noises are non-rhythmic, irregular, non-periodic vibrations, with no clearness of pitch, producing irritating sounds. Tones are melodious, soothing; noises are explosive.

Pure Tones. Simple, elementary, or pure tones differ in pitch, intensity, and duration. Pitch characterizes sounds as high or low, depending primarily on the frequency of the sound waves or vibration, the higher rate giving the higher pitch. Sound waves below or above certain frequencies go unheard. Different pitches have different carrying power. A high voice, or a shrieking, whistling noise, for example, carries farther than a low voice; a fire or police siren can be heard over the heavy noise of city streets and therefore justifies its usage.

INTENSITY or loudness of sound is the second important difference in pure tones. In hearing, its magnitude or quantity depends mostly

¹ See R. W. Husband, *General Psychology*, p. 112.

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on the amplitude of the sound event but it cannot be analyzed into nameable units.

DURATION, the third difference, is the continuance of the sensory factors in time, or the time occurrence of the sound event. It, too, is held to be irreducible as a factor in the sensory process. However, pitch, intensity, and duration all depend on the capacity of the

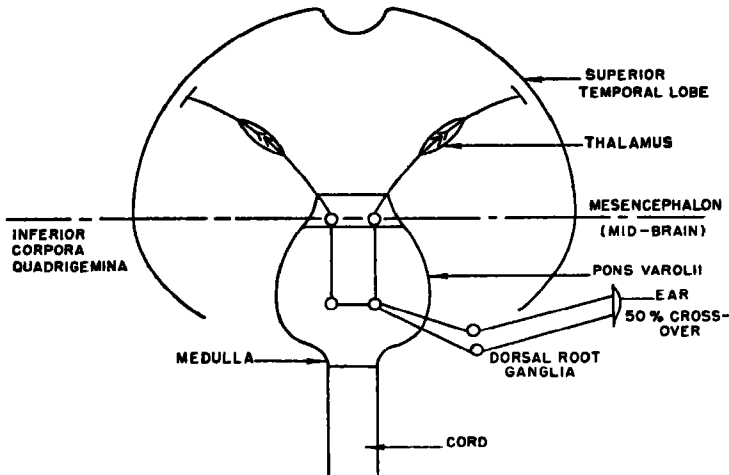


FIG. 31. Auditory apparatus.

auditory mechanism, and the physical stimulus of the sounding body for the expression of their sound characteristics.

Complex Tones. Most common sounds heard are complex or compound tones, not simple, pure tones. Compound tones consist of simple or pure tones of different pitches which, in combination, are called **partials**, meaning any one of the pure tones, with the lowest partial known as the **fundamental tone**, or the lowest vibrational frequency. Compound tones are analyzable either by careful auditory observation or by the aid of instrumentation. **Overtones** are compound tones, made up from fundamental and partials tones and caused by partial vibrations of the sounding body—the specific instrument or voice. Waves are broken into halves, fourths, thirds, etc., causing differing tones which make up the complex tone. This phenomenon is called **clang** which is representative of all musical tones.

Tone Quality or Timbre. Tones are steady and smooth because they express uniform vibrations. It is said that some 11,000 may be discriminated in the sound laboratory. Timbre (tim'ber) represents the quality of a tone determined chiefly by its form, and the character and quality of overtones. It varies according to the particular partials, the loudness or intensity of the partials, and the loudness of the complex tone or the combination heard. It is a common observation that tones of the same pitch coming from different musical instruments are recognized as coming from different instruments, such as a piano, organ, violin, or cornet. By means of timbre or quality differences in overtones we differentiate one musical instrument from another. In the same manner we identify an individual's voice, compare it with another, and designate it as being rich, or hollow, or full, or thin, and often form our likes and dislikes of people from their voice sounds.

Noise. Noise is frequently contrasted with tone. It is an irregular, non-periodic vibration that does not result in a clear sensation of pitch. Hissing, banging, screaming, explosive sounds are noise. Excessive intensity of sounds, particularly when they are very high or very low in pitch, may be confused with noise, mostly because they assault the sensory channels. Actually language sounds in spoken words may bear the semblance of noise in harshly spoken consonants which is characteristic of consonant usage. Fortunately this phase of noise in spoken language is usually saved by vowel sounds which are always tones.

AUDITORY SENSE PERCEPTION

Auditory sense perception is the interpretation and meaning of sounds, the evaluation and understanding of what is heard. The characteristics of auditory experience—tone, pitch, timbre, loudness, which are determined by the amplitude and frequency of the sound waves, change in the process of stimulation, that is, in the journey from the vibrating body to the ear, and in the ear-mechanism itself. This change of stimulus offers an important clue to our ability in estimating distance, direction, and space when sounds are involved. Hence the efficiency of hearing demands accurate localization of sounds and this developed ability is not easy, yet often necessary.

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This trained ability of the normal ear, capable of keen discrimination of sound location, is an urgent foundation for auditory sense perception or the adequate interpretation and meaning of sounds, therefore auditory cues should be vigilantly learned. Among these cues are the inequalities of loudness, variability of intensities which gives knowledge of distance and position. The loudness of a sound decreases with the increase of distance between the source of the sound and the individual reactor. The loudness of a sound gives the impression of closeness.

It should be noted that sounds are localized with relative accuracy on the horizontal plane, but sounds well to one side, either to the right or left, are not well-localized. Sounds above or below the ears are poorly localized. Sounds to the right or left that are comparatively near the ears are perceived correctly. Sounds in the front or back of the ears are judged with great difficulty. Noises generally are localized better than pure tones. The following illustration will indicate both advantages and disadvantages of sound position :

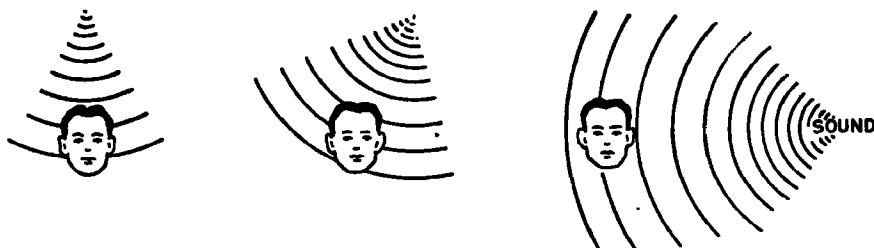


FIG. 32. Location of sound.

Sound Location. Sounds should be localized as accurately as possible in order to ensure certain efficiencies of life, otherwise man is stranded in a world that is meaningless to his hearing sense. Personal safety and ordinary effectiveness demand that we know from whence comes the sound and whither it proceeds. To effect this efficiency the movement of the head is important, as we have noted in the accompanying illustration. Position and movements of the head are related to the functioning of the semicircular canals which serve to help in proper head rotations when the direction of a sound must be ascertained.

Besides head movements there are other means of identifying a

sound which are reliable cues for sound localization. These means are:

INEQUALITY OF LOUDNESS. The loudness of a sound decreases with the increase of the distance between the source of the sound and the individual hearer.

INTENSITY. If two sounds differ in intensity but are equidistant the louder sound tends to be perceived as clear.

INTENSITY AND DISTANCE. When the intensity of sounds proceeding from different distances is equal the nearer sound is louder. Yet sounds appear to be purer as distance is increased. Distant sounds change in tone quality, as when an automobile horn is sounded at a distance, or a train whistle comes from a distance.

TIME. Sound waves differ for the two ears because of the capacity of the respective receptors where one ear picks up the sound before the other.

VISION. Seeing the object producing the sound always gives a strong clue for localization.

AUDITORY DISORDERS

Deafness and Mental Life. Deafness is a damaging sense factor in mental development. Weakened auditory acuity exposes the individual to inevitable handicaps in the acquisition of knowledge and tends to prevent normal behavior within social groups. It interferes with accurate perceptual experience which is always important in learning ability. In childhood deafness is peculiarly unfortunate since it develops a mental sluggishness because of perceptual omissions and the consequent inability to control and sustain the right mental attitudes required in periods of attention. The deaf are frequently misunderstood and misjudged, and may develop traits that are unwholesome, such as stubbornness, irritability, resentment, which prevent normal growth of mind and character.

Language Inadequacy of the Deaf. Language is the main avenue of mental progress; it is the physical stimulus to mental growth and development. Speech defects and related disabilities such as indistinct articulation, gross mispronunciation, limited vocabulary, and analogous conditions may be occasioned by language inadequacy. The individual thus affected is deplorably starved or stunted

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and sometimes perverted, called "deaf and dumb" just because excessive deafness prevents the speech channels from performing their required action. The totally deaf are isolated from a world of vocal language, being unable to speak because they do not hear spoken words.

Organic Auditory Disorders. It is certain that the major auditory disorder is deafness (anacusia), caused by injury of some kind to the ear. It may be in the tympanum, disabilities in the ossicles, lesions within the auditory nerve processes. These injuries may extend as deep as the basilar membrane and the cochlea within the inner ear. Drug effects, malformation or blocking of the eustachian tube, inflammation of the middle ear, circulatory disturbances, or unequal pressure on the ear drums cause ringing; roaring sensations in the ears are the basis for the defect known as tinnitus aurium.

Middle ear disease, as it is popularly called, is usually a degree of otitis media or inflammation of the mastoid cells, eustachian tube, tympanum and related membranes which interfere with the normal functioning of the tiny ossicle bones. It is often caused by catarrhal colds and systemic infections.

Inner ear trouble may be due to a disturbance of the auditory mechanism situated beyond the ossicles, or to difficulties within the auditory nerve tract, or in the auditory brain center. Disturbances of the auditory mechanism may be regarded as less serious than major defects in the visual apparatus, because in modern civilization we use our eyes more than we use our ears in ordinary life situations. Still, auditory defects must not be minimized since the hearing sense is one of the highest sense values that we possess.

Functional Auditory Disorders. Occasionally we meet a type of deafness in which the auditory mechanism is apparently normal, but nevertheless the individual has difficulty in hearing. Such cases are said to be psychological; they are due to personal factors within the individual, some personality disturbance. Such is the case of a frustrated individual whose absent-mindedness is mistaken for an auditory weakness when, in fact, it is clearly an illusion of the personality. Before an auditory perceptive disturbance of this nature is remedied the specific personality disability must be removed.

Frequently people carry subjective sounds, such as a telephone

buzz caused by too frequent use of the telephone. This kind of persistent disorder is sometimes called occupational neurosis, a functional disorder of the nervous system characterizing the individual's behavior. Disturbances of this kind should not be minimized, they should be checked and overcome by proper relaxation and the attainment of good physical health.

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ORIENTATION

TASTE

- I. Physiological Aspects of Taste.
 - 1. Taste receptors (taste buds): (a) papillae (vallate); (b) fungiform; (c) filiform; and (d) simple papillae.
- II. Sensitivities of Taste.
 - 1. Psychological stimuli: (a) chemically effective solutions.
 - 2. Four primary taste qualities: (a) sour; (b) salt; (c) sweet; and (d) bitter.
 - 3. Taste and smell relationships.
 - 4. Other taste factors: (a) intensity; (b) distribution; (c) fusion; (d) compensation; (e) contrast; (f) adaptation; (g) age.
- III. Disorders of Taste: (1) organic disorders: (a) ageusia or loss of taste, (b) hypergeusia or contradictory tastes; (2) functional disorders or food prejudices.

SMELL

- I. Physiological Aspects of Smell.
 - 1. Smell receptors: hair-like processes in mucous membrane of nose.
- II. Sensitivities of Smell.
 - 1. Psychological stimuli: gaseous particles, cold, heat, tickling, pain, tension, pressure.
 - 2. The naming of odors: putrid, flowery, fruity, spicy, burned, resinous.
 - 3. Other smell factors: (a) fusion; (b) adaptation; (c) intensity; (d) location; (f) olfactory memories.

7

Taste and Smell

TASTE

The function of taste is to perceive and appreciate food and to guide us in accepting or rejecting it. Usually taste is a blend which includes smell, for when olfaction is eliminated many foods become tasteless. Taste and smell are allied senses since the sense qualities for each depend on the chemical action of the coordinated stimulus. The flavor of foods consists largely of smell factors, and most of the pleasing and displeasing tastes are compounds of taste, smell, touch, temperature, and sometimes muscle sensations.

Physiological Aspects of Taste

Taste Receptors. The true receptors for taste are the taste buds, or gustatory cells. They are located chiefly in the mucous lining of the tongue, in the soft palate, cheeks, and epiglottis. Taste buds are ovoid bodies with an external layer of supporting cells. They contain a number of elongated structures which end in hair-like processes that project through the central taste pore. The cells and the hair-like processes probably are the parts stimulated by the taste substances, reenforced by mechanisms that receive tactile stimuli—touch, temperature, aided to some extent by the muscular senses.

THE TONGUE is the general organ of taste, although its real function is manipulation in the chewing of food and the formation of speech behavior. The surface of the tongue is covered with a mucous membrane studded with papillae, or connective tissue, containing nerve endings and capillaries, of which there are four varieties—vallate, fungiform, filiform, and simple papillae. Vallate, or circumvallate papillae, are the largest of the taste structures. They form a V-shaped row near the root of the tongue, with the point of the V

turned toward the lips, and have the function of secreting mucin in their numerous cells. Fungiform papillae are the next in size, deriving their name from resemblance to fungi in shape. Fungiform papillae are found chiefly on the tip and sides of the tongue and contain from three to twenty taste buds each. Filiform papillae cover the anterior of the tongue, and on their free surface bear delicate brush-like processes which seem to have a highly developed sense of touch, especially on the tip of the tongue. Simple papillae, similar to those of the skin, cover the larger papillae and the entire mucous membrane of the tongue surface.

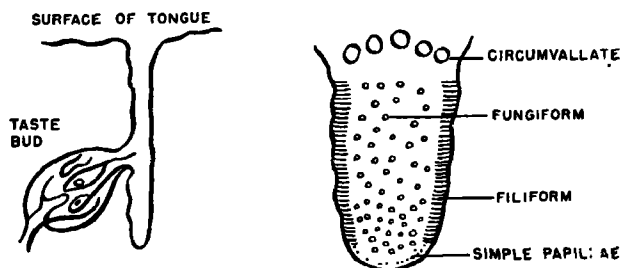


FIG. 33. The tongue and taste buds.

Nerve fibers terminate in the taste buds and give the tongue a high degree of sensitivity. These fibers are filaments of the lingual nerve, which is a branch of the fifth or trigeminal nerve, filaments of the seventh or facial nerve, or filaments of the ninth or glossopharyngeal nerve. The twelfth or hypoglossal nerve distributes motor impulses to the tongue but is not considered important in the actual sense of taste or touch.

The Sensitivities of Taste

Psychological Stimuli. The true stimuli of taste are chemically effective solutions that enter the taste buds through the taste pores. The stimuli are always liquid in form, and solid substances must be dissolved by action of salivary secretion. The exciting taste substances act by producing a change in the taste buds, and this change furnishes the required stimulus. Of the many stimuli which excite the various tactile end organs on the tongue and in the mouth the

following are important: sensations of temperature involved in eating hot and cold foods; sensations of pressure or texture, such as in hard, heavy foods, smooth foods, coarse foods. It is relatively easy to discriminate foods by their texture even when the senses of taste, smell, and vision are at a minimum.

Four Primary Qualities of Taste. The four primary qualities of taste are: sour, salt, sweet, and bitter. Their relationship is shown by the Henning Taste Tetrahedron.

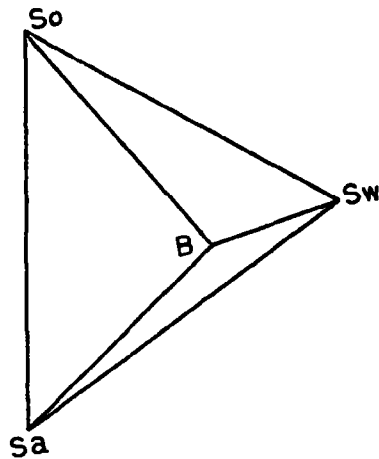


FIG. 34. The Henning taste tetrahedron.

Generally the stimulus for sour depends upon acids and acid-producing compounds which, according to Boring,¹ seem to be free hydrogen ions of acid substances in solution. Saline sensations are aroused by a large number of inorganic salts of chlorine, bromine, and iodine.

Sweet sensations depend upon carbohydrates—the sugars and the alcohols, although there are some few inorganic compounds, like lead acetate, which are sweet. Bitter sensations are caused by alkaloids like quinine and solutions containing the positive ions of magnesium, ammonium and calcium, which are usually bitter. But this primary quality can be aroused also by many organic substances

¹ E. G. Boring, and collaborators, *Psychology*, p. 142.

in which the structure of the molecule is more important than the elements which it contains.²

Taste and Smell Relationships. Taste and smell are often confused. Some substances appear to have very pronounced tastes when in fact they have little or no taste. This confusion of sensitivity is explained by the fact that much of the food we eat consists of odorous substances. We breathe as we chew, and the odor-producing particles are carried out through the nostrils with exhaled air. It is natural to associate these stimulations with taste, but a careful observer can distinguish between the gustatory, olfactory, and tactual components of the taste reaction. However, this complexity of taste really makes up what we know as the flavor of foods, which contributes to our delight or disgust, our pleasure or prejudice. Hence, delightful tastes are often pleasurable odors, and disagreeable tastes are really disagreeable odors. Many volatile substances which enter the mouth through the nostrils, stimulating the taste buds, are interpreted as odors. The odor of chloroform, for example, is due largely to the stimulation of sweet sensitivity in the mouth. Taste, then, is a very tricky sense, as every parent knows through child likes and dislikes and in his own periods of sickness.

Tastes may be pure or complex. Commonly they are complex when they are mixtures of taste and smell stimulations, taste and touch sensations, or a combination of all these sensitivities.

Other Taste Factors. Besides the primary qualities of taste specified as sour, salt, sweet, bitter, there are other observable qualities which are important in taste experiences, namely, intensity, distribution, fusion, compensation, contrast, adaptation, and age.

INTENSITY. Some tastes are intense, depending upon the predominance of likes and dislikes for certain foods. Some people like fish, others despise it. Intensity plays a dominant role in such taste reactions.

DISTRIBUTION. Some experimentalists have noted that different regions of the tongue react to different stimuli. They have discovered that the tip of the tongue is most sensitive to sweet, the back of the tongue to bitter, the sides of the tongue to sour, with salt being sensed in all tongue and mouth regions. Distribution of taste

² E. G. Boring, and collaborators, *Psychology*, p. 142.

sensitivities, therefore, is necessary for taste experiences in everyday living.

FUSION. Sensitivities are frequently fused to create a new taste experience. Many drinks are fusions, as, for example, lemonade, which has both a sweet and a sour taste—a mixture pleasant to most people.

COMPENSATION. In taste fusion and mixture the primary qualities of sour, salt, sweet, and bitter are perceived as less intense than each would be alone. Lemonade is less sour and less sweet because of the compensating effects of acid and sugar, although compensation is never absolute.

CONTRAST. In some taste experiences one of the primary taste qualities may be in high contrast with another; for example, bitter usually increases the sensitivity for sweet, as when candy makes an orange seem sour, or sugar makes coffee less bitter.

ADAPTATION. Adaptation to taste is slow and insecure, far less than smell or vision, which may account for persistent food dislikes. But one can educate himself in taste adaptation and slowly build up a tolerance for a despised food.

AGE. Taste is apparently more sensitive in childhood than in adulthood. Children may have more taste buds than adults, or they may be more sensitive and less dependent upon taste habits. As they grow older they adapt themselves more readily and eat many foods they refused in earlier years.

DISORDERS OF TASTE

The disorders of taste are of two kinds: organic and functional.

The organic disorders include loss of taste or ageusia, especially for bitter substances due to an inherited defect; and an exaggerated sense of taste, hypergeusia, wherein tastes assume a super-form, or when a completely different taste appears after eating its opposite, such as sour after eating sweet foods. In sickness the taste sense is always subject to alteration by the very fact of sickness. Upsetting conditions should be abated whenever and wherever possible.

The functional disorders show in extreme likes and dislikes for foods which may become an obsession menacing health. Functional

taste anomalies, besides being unhealthful, invade the sanctities of life; they cause severe annoyance and sometimes upset domestic relations. Many functional taste disabilities are baseless and result from conditioning in the early years, as is evidenced so much in childhood habits. However, taste disabilities may steal on us at any time of life. One should overcome his food prejudices, for unless there be disturbing organic reactions, any good food is always advantageous to the body and should likewise be appreciated in the interests of psychological variety and values.

SMELL, THE OLFACTORY SENSE

Physiological Aspects of Smell

Smell Receptors. The receptors for smell are located in the linings of the nostrils, far back in the nasal passages. They are of two types, situated in different sections of the nasal cavity and are the endings for different nerves. The first group of receptors are located in the upper part of the nasal cavity, each cell bearing on its free end a tuft of six to eight hair-like processes which lie in the mucous membrane of the nose. They are spindle-shaped cells supported by epithelial cells of a columnar shape. At the edge of the cells there is a limiting membrane through which the olfactory hairs project. The basal ends of the cells are prolonged as nerve fibers which pass through the interstices of bone and end in a mass of gray matter called the olfactory bulb. From the olfactory bulb the cells give rise to fibers which pass to the brain through the first or olfactory nerve.

The second group of receptors receive impulses of a tactile nature, and may be called tactile-smell receptors, because they give the combined sense of smell and touch. These receptors are located in the lower part of the mucous membrane of the nasal cavity.

The Sensitivities of Smell

Psychological Stimuli. The stimuli for the true receptors of smell are certain gaseous particles, and only those particles that

are soluble in the olfactory membrane are effective. These gaseous particles enter the nasal cavity being diffused through the air we breathe. Sniffing, therefore, greatly increases smell sensitivity.

The stimuli for the tactile smell receptors are sensations of cold, heat, tickling, pain, tension, and pressure. The smell of camphor or of menthol is partly a sensation of cold. The pungent odor of ammonia, acetic acid, chlorine or iodine is partly pain. Smell stimulations, then, may be pure odors, affecting the true smell receptors, odors fused with sensations from the tactile receptors, and odors fused or confused with tastes.

The Naming of Odors. Odors are named by objects or classes that give rise to them, such as cinnamon, cloves, rose, garden, bakery. An excellent classification is given by the Henning Smell Prism.

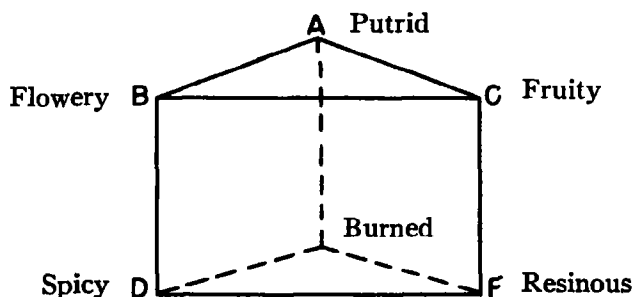


FIG. 35. Henning Smell Prism.

The figure establishes six primary classes of odors, as named. Odors of intermediate qualities lie on the edges or on the surfaces of the prism, being so established in relation to two or three or four of the primary classes; for example, onion is mostly putrid, but also flowery, burned, and spicy. In general, putrid and burned odors tend to be unpleasant and the odors of the other four classes pleasant.

Other Smell Factors. Like all the exteroceptive senses, smell is not a simple sense and it carries some half-dozen characteristics that enhance its value.

Fusion. Two odors may fuse and give rise to what appears to be an entirely new smell stimulus, and the simultaneous presentation of such odors may result in one neutralizing the other, as in the case of deodorants.

ADAPTATION. Smell is subject to rapid adaptation and may be complete in a few minutes. This adaptation facility is often a great convenience, as when one is the victim of a disagreeable odor or an irritating odor such as man must sometimes endure. Adaptation is therefore necessarily selective, reducing the sensitivity for one stimulus and producing less or none for the other. Thus, adaptation to camphor results in diminished sensitivity as in the odor of ether. Adaptation also shows modulation, meaning that the qualities of some odorous substances change as adaptation goes on. Thus, at high intensities, ionone resembles cedarwood, but at low intensities it is like violet. Hence, the quality of the odor changes as it becomes fainter under adaptation. After complete adaptation, recovery seldom requires more than five minutes, but the rate of recovery always depends upon the nature and intensity of the stimulus, the time element, and the individual concerned.

INTENSITY. Intensity differences in smell depend on the density and the quantity of the particles drawn into the nostrils at one time. With uniform breathing the intensity is greater according to the mass of particles emanating from the odorous substance.

LOCATION. The source of an odor can be detected with the help of exploratory movements because intensity increases on approach, and movement permits some degree of bodily orientation toward the point from which the odor arises.

OLFACTORY MEMORIES. Man's olfactory memories are good. Many past experiences can be recalled by association with present stimuli; hence, some memories of odors, good or bad, never leave us entirely.

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ORIENTATION

Touch, with its correlates in the motor senses, is one of the great senses of man. It aids vision and hearing and makes vast contribution to skills of body and limb. Tactual sensitivity should be maintained at a high level, commanding efficiencies in pressure, pain, and temperature. The chapter introduces the physiology of the skin and its sense reaction.

I. The Physiology of the Skin.

A. Anatomic construction.

II. The Psychology of Touch.

A. Tactual sensitivities and cutaneous qualities; the sensitive areas of the skin.

B. Function of touch—to acquaint man with his surroundings and add to the formation of knowledge by developing tactual skills.

C. Four tactual senses—pressure, pain, warmth, cold.

1. Pressure, the sensitivity for skills.

2. Pain, the survival value that warns of danger, hurt, illness.

3. Temperature: (a) warm, (b) cold.

III. Cutaneous Disorders.

A. Anesthesias.

B. Hyperesthesias.

8

Cutaneous, Tactual Sensitivities: The Experience of Touch

The skin contains various receptors, distributed irregularly over the body surface, which are responsible for the different kinds of tactual-cutaneous experiences. These sensitivities give rise to several qualitative patterns of perceptual response or knowledge which are important for the proper functioning of the body. The skin is not uniformly sensitive to tactual sensitivity because of the irregular distribution of the specialized receptors.

THE PHYSIOLOGY OF THE SKIN

Anatomic Construction. The skin consists of two important cutaneous layers called the epidermis and the dermis.

The epidermis is a hard, oily, irregular, pliable, outside skin layer, which is subject to deformation when a mechanical stimulus is applied.

The dermis contains the various nerve endings, hair bulbs, sweat glands, sebaceous glands, muscle tissues, and blood vessels. The skin varies in thickness in different parts of the body. It is thin in the eyelids, very thick on the palms of the hands and tips of the fingers, and on the soles of the feet.

Receptors. Receptors for the various touch sensitivities have been recognized as shown in the following classification:

CORRELATED RECEPTOR	QUALITY OF SENSITIVITY
Hair bulbs	1. Pressure
Meissner corpuscles	
Merkel corpuscles	

CORRELATED RECEPTOR	QUALITY OF SENSITIVITY
Free nerve endings	2. Pain
Ruffini cylinders	3. Warmth
Krause end-bulbs	4. Cold
Free nerve endings	5. Contact
The Meissner corpuscle in the papilla of the skin, a nerve structure enclosed in a sheet of connective tissue	6. Deep pressure
The Pacinian corpuscle in the nerve fiber covered with concentric layers; nerve endings wrapped around hair follicles; and free nerve endings	

The receptors most firmly established for the cutaneous sense are the hair bulbs and the free nerve endings.

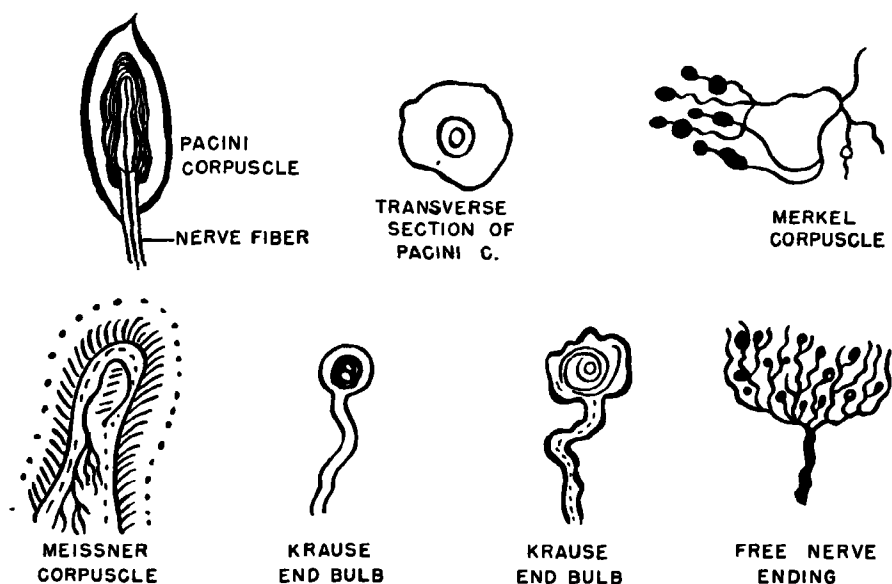


FIG. 36. Cutaneous sense receptors.

THE PSYCHOLOGY OF TOUCH

Tactual Sensitivities and Cutaneous Qualities. Through exploration of the skin with different types of stimuli the receptors for varying patterns of cutaneous experience have been segregated. Specialized spots are found for pressure, pain, warmth, cold, and combinations of these sensitivities. Because of this specialization some areas of the body are more sensitive to touch than other areas. The soles of the feet are highly susceptible to tickle, to pain from bumps, and to small stones. The finger tips and the inner surface of the upper arm are very sensitive in tactual experiences. Other areas of the body differ both qualitatively and quantitatively in this tactual reaction.

The Function of Touch. By the activity of tactual sensitivities we become acquainted with objects in our environment, and thereby add to the formation of knowledge. Tactual experience supports our sense of sight and hearing. We know objects better when they are both seen and touched.

Four Tactual Senses. The four basic senses of the skin are: (1) Pressure; (2) Pain; (3) Warmth; and (4) Cold. Sometimes itch and tickle are added. In all cases skin sensitivities represent responses to mechanical, chemical, electrical, and thermal stimuli.

Mechanical stimulations are represented by such contacts as pin pricks which give rise to the sense of pressure. The particular quality of pressure depends on the degree of skin deformation and the particular area of the skin that is involved. The stimuli act either by direct contact or through the leverage of a hair, the hairy regions of the skin being more sensitive to touch than other parts of the body. Weak mechanical stimuli, such as a feather touching the skin, indicate light pressure and produce tickle. Stimuli neither weak nor strong indicate intermediate pressures and produce mere contact sensations.

Chemical stimuli in touch are represented by acids which "bite" or "burn" the skin. Electrical stimulations are well known from the "shocks" one receives in touching a live wire or a defective electrical appliance. Thermal stimuli are those received by contact with hot, warm, and cold objects.

Touch sensitivities depend on three groups of factors which largely determine this important sense, namely: (1) the kind, strength, and duration of the stimulus that is applied; (2) the particular area of the skin involved; and (3) the condition of the skin at the time of stimulation. These factors produce touch experiences that have been expressed by a wide variety of terms. We refer to them as rough, smooth, sticky, hard, wet, dry, light, heavy, clammy, greasy, itchy, ticklish. The last two named and many other cutaneous experiences are tactual combinations.

FOUR MAJOR SKIN SENSITIVITIES

1. **Pressure.** Pressure spots vary widely in different areas of the body, and with different intensities for the various areas.¹

The discovery of pressure spots is effected experimentally by the use of horse hair, or boar bristles mounted at right angles on a wooden skewer. This procedure is necessary to facilitate mechanical exactness in applying the stimulus to the skin. Surveying the skin by this method it is noted that impressions are received in some areas while at other points no reaction is evidenced. Pressure spots tend to increase in sensitivity toward the extremes of the limbs and other mobile parts of the body, where it is important to develop manual skills.

2. **Pain.** Tactual pain is mediated by free-nerve endings in the skin. These nerve endings are near the skin surface since their function is to protect the organism from harmful stimuli. Pain spots have a greater density than pressure spots. They are estimated as existing at an average of 100 to 175 per square centimeter, and vary widely in the different areas of the body.

The function of pain represents a survival value. It warns of dangers, such as hurt, illness, destruction of body tissue, which, if unheeded or unnecessarily ignored, may be fatal to life. Many kinds of pain have been enumerated. These may be grouped into four major categories, namely: (1) for touch—pricks, stings, burns, scratches; (2) for pressure—bruises, muscular soreness; (3) for

¹ For diagrams of pressure and temperature spots, see Gardner Murphy, *General Psychology*, 1933, p. 118, and also H. C. Warren and L. Carmichael, *Elements of Human Psychology*, 1930, p. 129.

temperature—burns; (4) for the organic senses commonly called feelings—nausea, stomach pains, etc.

The general stimulus for pain is excessive stimulation, or over-strong stimulation of any receptor, occasioned by mechanical, chemical, electrical, or thermal means. Such overstimulation tends to destroy the protoplasmic properties of the organism. Pain reactions arise from sharp blows, strong chemical or electrical contacts, extremes of heat and cold. For some regions of the body pain results from injury to the tissues, such as mishaps produced by cutting, pinching, burning. Changes in the tissues evidence pain resulting from long contact, as when a hot object is grasped or held. It may not give immediate pain but long contact will induce a pain reaction. Excessive contractions of the muscles cause pain, such as cramps in the stomach, in the intestinal walls, and undue fatigue of the muscles. The inability to experience pain sensations is called *analgesia*. It is seldom induced naturally, and usually through anesthesia.

3. **Temperature.** Temperature is sensed through two distinct sets of receptors producing the experience of warmth and cold.²

WARMTH. The sense organs for warmth are considered to be the Ruffini corpuscles, a tangle of nerve endings enclosed in a web of connective tissue. It is estimated there are some 30,000 warmth receptors scattered over the surface of the body, although they vary in density in different areas.³ Stimulation of the warmth receptors is occasioned by any object which is thermally higher than the temperature of the skin making contact with the body. The skin temperature is known as physiological zero; above it a stimulus should be felt as warm, and below it as cold.

Although the body temperature remains constant in normal health the temperature of the skin appears to vary; hence, warm and cold sensations shift with the temperature of the skin. Exposed skin surfaces are about 8 to 10 degrees cooler than internal body temperatures. The temperature range for warmth is usually from 35 to 70 degrees C. with varying physiological zeros set by adaptation conditions. A room with a temperature of 90 degrees F. appears neutral

² For diagrams of temperature spots, see Pillsbury, *Fundamentals of Psychology*, 1934, p. 168; Warren and Carmichael, *Elements of Human Psychology*, 1930, p. 129; Gardner Murphy, *General Psychology*, p. 117.

³ For diagram of warm and cold spots, see L. E. Cole, *General Psychology*, 1939, p. 94.

to a naked individual. A room with a temperature above 90 degrees F. appears warm, and below 90 degrees the same room appears cool to a naked individual.

Pain, in temperature, resulting in painfully hot experiences, appears above 115 degrees F., which is a very hot temperature. In such stimulation the mechanism warns of danger which might result in tissue injury. Painfully cold experiences are produced when the temperature is below 55 degrees F.

COLD. The sense of cold is mediated by so-called cold spots which vary in density for various areas of the body, with an estimated average of 7 to 13 per square centimeter.

The sense organs for cold sensitivities are conventionally held to be the Krause end bulbs, the bulb being an arborization of nerve fibers enclosed in a corpuscle or multicellular body. These receptors are closer to the skin surface and are stimulated more easily than the touch spots. Cold spots, like hot spots, may be explored and located by applying a metal rod, or needle dipped in ice-water (using hot water or flame for hot stimulation), to a half inch square of hairless skin.

The temperature range for cold stimulation is usually from 10 to 30 degrees C. with varying physiological zeros and psychological differences determined by adaptation conditions.

Touch Blends. Some skin sensations are complex, they are combinations of several tactual characteristics and represent touch fusions. The following are illustrations: experiences spoken of as sharp and blunt are really combinations of pain and pressure; clamminess is a combination of cold and pressure; wetness is a combination of pressure, warmth, and cold; intense cold is a combination of cold and pain; intense heat is a combination of paradoxical cold, warmth, and pain.

Tactual Adaptation. Adaptation occurs in touch and pressure sensitivities as in the other senses. As an example, if contact is made of an object with the skin, such as tight clothing, after some seconds adaptation tends to occur and the tightness ceases to be sensed. In this event a protective adaptation of the stimulus is maintained until after the object has been removed. Adaptation to pressure is disclosed by wearers of spectacles or wrist watches. After a relatively short

time they are, as we say, not felt, which means that they are not tactually sensed by the wearer.

Criticism of the Receptor Theory for Tactual Sensitivity. The conventional theory which we have mentioned in this chapter postulating the existence of specific organs for varieties of tactual sensitivity has been criticized from time to time. It has been held by several investigators that the definite location of touch spots is uncertain and subject to considerable revision. This conclusion has been maintained by experimentalists who have noted that by varying the temperature of the metal-point stimulus and its pressure, the position of the spots appeared to change. It has likewise been disclosed that when the temperature of the stimulus point is raised more spots can be found, and that more pressure will tend to increase the number of the pressure spots. All of this would indicate the existence of additional nerve receptors beyond touch, pain, warmth, and cold experiences, which shows that our knowledge of tactual sensitivity is far from complete.

CUTANEOUS DISORDERS

Cutaneous disorders are the anesthetics and the hyperesthesias. The anesthetics are losses within the several touch sensitivities, indicating a depreciation of the pressure sense, known as baranesthesia; loss of the ability to recognize warmth, known as atalposia; loss of sensitivity for cold, arrhigosia; loss of sensation for pain, analgesia; loss of sensation for tickle, gargalanesthesia; loss of the ability to recognize vibration, palmanesthesia.

The hyperesthesias represent organic sensitivities to tactual stimuli that are unusual and excessive. This disturbance may be caused by toxins, by nerve disturbances, or by the stimulation of the individual by medicines, drugs, and alcohol. The hyperesthesias are especially observable in sickness and predispose the patient to great apprehension and undue sensitiveness.

Within the anesthetics and hyperesthesias are the disturbances of the perversion and functional variety. Some of these disabilities are caused by lesions giving unusual and unnatural sensations that are excessively unpleasant, known as phrictopathia. Some indicate a disability in the localization of touch because of undeveloped or

imperfect tactual sense perception, and are known as dyschiria. Some stimulations in the disordered touch reaction give sensations in the body at places opposite to the point of contact, and are called allochiria. The strange malady which presents an inability to recognize familiar objects by touch is known as astereognosis; and sensations that occur without adequate stimuli, a common condition with alcoholics and drug addicts especially in their hallucinations, is a definite perversion.

The true functional touch disorders are tricky and bewitching. Various parts of the body lose their sensitivity, as in the so-called "glove anesthesia," and "stocking anesthesia." The areas involved may become anesthetic suddenly by some faulty nervous functioning, or by suggestion.

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DIAGRAMS : WARM AND COLD SPOTS

COLE : *op. cit.*, p. 94.

PILLSBURY : *op. cit.*, p. 168.

WARREN and CARMICHAEL : *op. cit.*, p. 129.

ORIENTATION

By the muscle senses we become aware of body positions and movements. Ordinarily the muscle senses are coordinated with the senses of touch and vision. In this combination skills are advanced.

This chapter discusses the Motor Senses which include the kinesthetic and the static-equilibric senses.

I. Kinesthetic Sensitivities.

A. Kinesthetic receptors.

1. Muscles: furnish sensations characterized as pressure, dull pain, soreness, ache.
2. Tendons: furnish orientation and adaptation of the movable parts of the body.
3. Joints: furnish articular sensations providing major contributions to the kinesthetic sense.

B. Stimulation.

1. Muscle pressures, traction.
2. To some extent electrical, chemical.

C. Importance of kinesthetic activity.

1. Skills, precision, speed, accuracy, and other motor abilities, such as posture, walking, balance.

II. Static, Equilibric, Labyrinth Sensitivities.

A. Static receptors (membranous labyrinth).

1. Crista membrane.
2. Macula.
3. Inner ear.

B. Stimulation.

1. Movements of the head.
2. Thermal irrigations.
3. Chemical applications.
4. Electrical treatments.
5. Reflexes.

C. Psychological reaction.

1. Body's position and direction of movements, needed for effective operation of the organism.

III. Disorders of the Motor Senses.

A. Hyperkinesis.

B. Hypokinesis.

C. Dizziness.

D. Nystagmus.



9

Motor Senses

PROPRIOCEPTION—THE EXPERIENCE OF MOVEMENT

The motor senses of man include (1) kinesthetic senses, usually known as the muscle senses, and (2) the static or equilibrium senses. The receptors for these senses are known as proprioceptors, localized in the muscles, tendons, and joints.

KINESTHETIC SENSITIVITIES

Kinesthetic or muscle sensations occur through the stimulation of sensory nerves which start in the muscle spindles and in the joints, aided by the skin, the semicircular canals, and vision. These structures are widely distributed, being more or less present in all connective tissues. The sensitive motor mechanism of the body furnishes a mass of sensations often difficult to differentiate, yet they supply the basis for the perception of bodily movement.

Kinesthetic Receptors and Their Stimulation. The kinesthetic receptors are the muscles, tendons, and joints. Each are important in the experience of movement, but they usually operate coordinately.

1. **THE MUSCLES.** The muscles are well supplied with sensory nerves. Free nerve endings terminate between the muscle fibers. Pacini corpuscles are found in the muscle sheaths, and muscle spindles lie within the connective tissue surrounding bundles of muscle fibers. From these parts mechanical pressures or traction furnish mild and strong sensations characterized as pressure, dull pain, soreness, and ache. To some extent electrical and chemical forces act as muscular stimuli, reenforcing the mechanical pressures. Investigations ¹ have

¹ See E. G. Boring, and others, *Psychology*, p. 174.

indicated that dull pressure is mediated by the muscle spindles, and that different intensities of stimulation of the free nerve endings produce dull pain and ache.

2. **TENDONS.** When the muscles are stimulated, surrounding and contiguous structures are involved. The source of tendon sensations are the free nerve endings, said to be the corpuscles of Golgi and Pacini, which offer the same qualities of experience as the muscles. The tendons are stimulated primarily by muscular contraction and stretching or tension, which at high intensity produces pain, as in lifting a heavy weight. In less intensity there occurs a sense of strain only.

It is difficult to separate tendon sensations from those which emanate from the muscles. Both function in orientation and adaptation of the movable parts of the body, and their normal expressions produce exhilarations of body posture and movement. Both provide life with the thrills of muscular sensibilities, and make for speed and accuracies in common everyday skills.

3. **JOINTS.** Like the tendons, the joints cannot be separated from their colonies of function. Tissues at the joints are closely compacted; hence, any movement of the elbow, knee, fingers, wrist, present muscular experience of pressure, mediated by the free nerve endings which offer facility of movement, and when unduly stimulated produce pain.

Joints or articular sensations, like muscles and tendons, are stimulated primarily by tension and compression through the bending of flexor structures. This activity produces psychological reactions of pressure similar to cutaneous or touch experiences. Joint sensations are simple and forceful, issuing in strain-directed movements. Kinesthetic activity is generally more dependent upon the joints than on the changes that occur in the muscles and tendons. Particularly is this true of posture, which is notably dependent upon this particular sense in its orientation function.

Importance of Kinesthetic Activity. The coordination of body movements is important for the perfecting of skills, the acquiring of precision, speed, accuracy, and all other matters relating to the life of the body and its motor abilities. Accordingly, kinesthetic ability is fundamental to successful posture and balance. It promotes

facilities in walking and the necessities of locomotion, develops common skills, such as using tools, playing the piano, and similar mechanical activities.

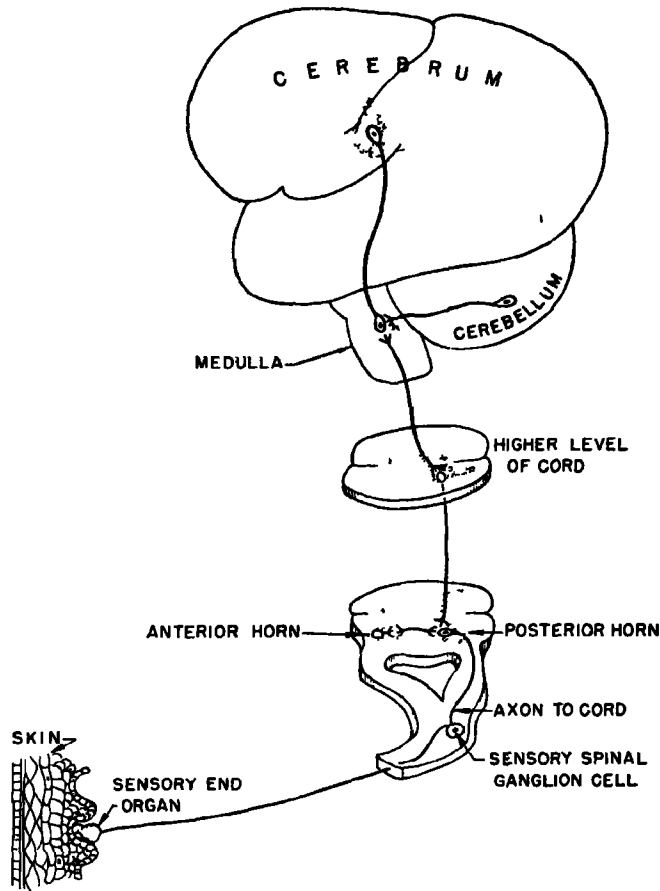


FIG. 37. Course of sensory fiber.

STATIC, EQUILIBRIC, LABYRINTH SENSES

Kinesthesia, through its musculature, relates to static sensitivity and gives experience of the body's position and the direction of the body's movement. Static sensibility therefore enables us to know whether we are sitting or standing, leaning, bending, going forward or backward, and so on. It is an important sense but seldom thought

of in our human experience because of our well-wrought motor habits and well-established equilibrium.

Static Receptors and Their Stimulation. The receptors for the static-labyrinth sensations are the semicircular canals and sacs of the inner ear. The specific functional receptive organs within the

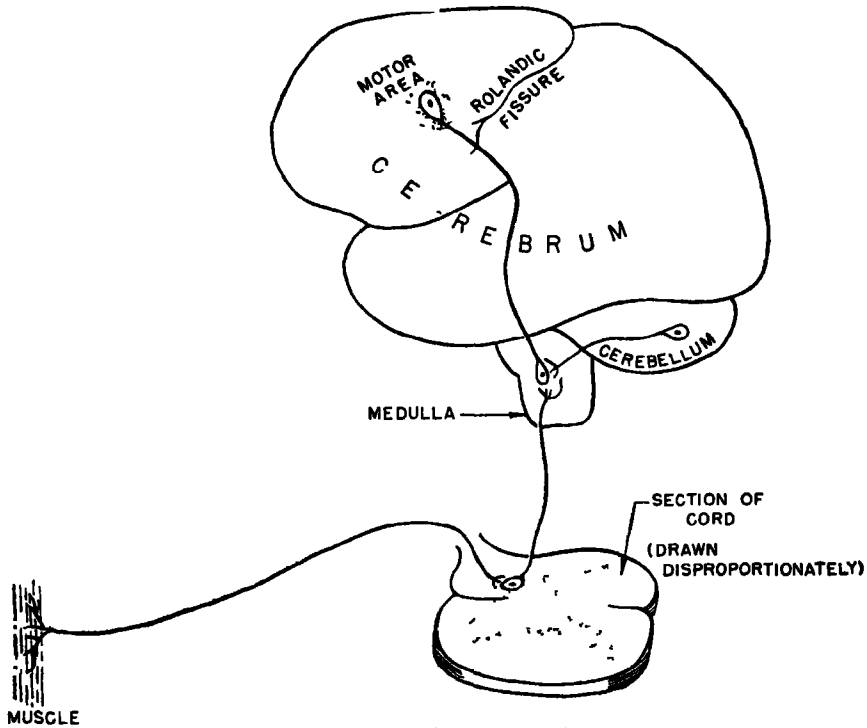


FIG. 38. Course of a motor fiber.

semicircular canals are thought to be the crista membrane and the macula. The three major parts of the inner ear: (1) the cochlea with its organs of Corti; (2) the semicircular canals; (3) the saccule and the utricle of the vestibule, all contribute to the static-labyrinth group of sensitivities. The accompanying diagram outlines the membranous labyrinth.

The stimulation of the labyrinth regions, particularly the semicircular canals and sacs in the inner ear, occurs as a result of several conditions, enumerated in the following list:

1. Change in the position of the head.
2. Movements of the head, either circular, affecting the crista of the semicircular canals, or by rectilineal movements involving a change in the position of the head or the vestibular organs (the macula of the utricle and the saccule).
3. Thermal irrigations of the external ear by hot or cold substances.
4. Chemical applications, such as some drugs.
5. Electrical treatments.

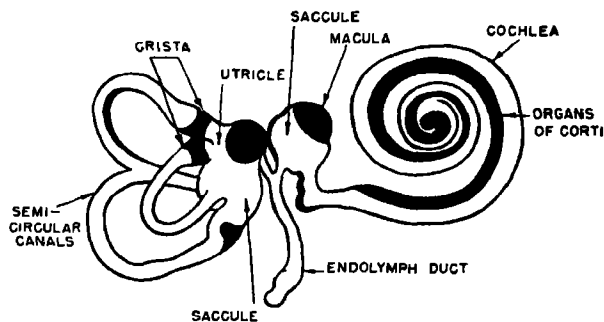


FIG. 39. The membranous labyrinth.

6. Reflexes occurring through visual excitations, such as looking into a deep pit or hole, looking down from the top of a high building; excitations from the stomach occasioned by sudden nausea; excitations from drugs, medicines, alcohol.

Psychological Reaction. The psychological effects of the stimulation of the semicircular canals show in ordinary normal ability expressed in balance and movement, which is needed for the effective operation of the organism. When this ability is maintained dizziness and kindred ill-effects are avoided. Kinesthetic and related cutaneous experiences, evidenced in balance and posture, are a further reaction of the motor senses. Kinesthetic ability shows in efficiency in sports, in dancing, and in all skilled manipulatory habits.

In their less normal reactions the undue stimulation of the labyrinth gives involuntary muscular responses, such as nystagmus; visceral and autonomic changes in the body, evidenced in seasickness,

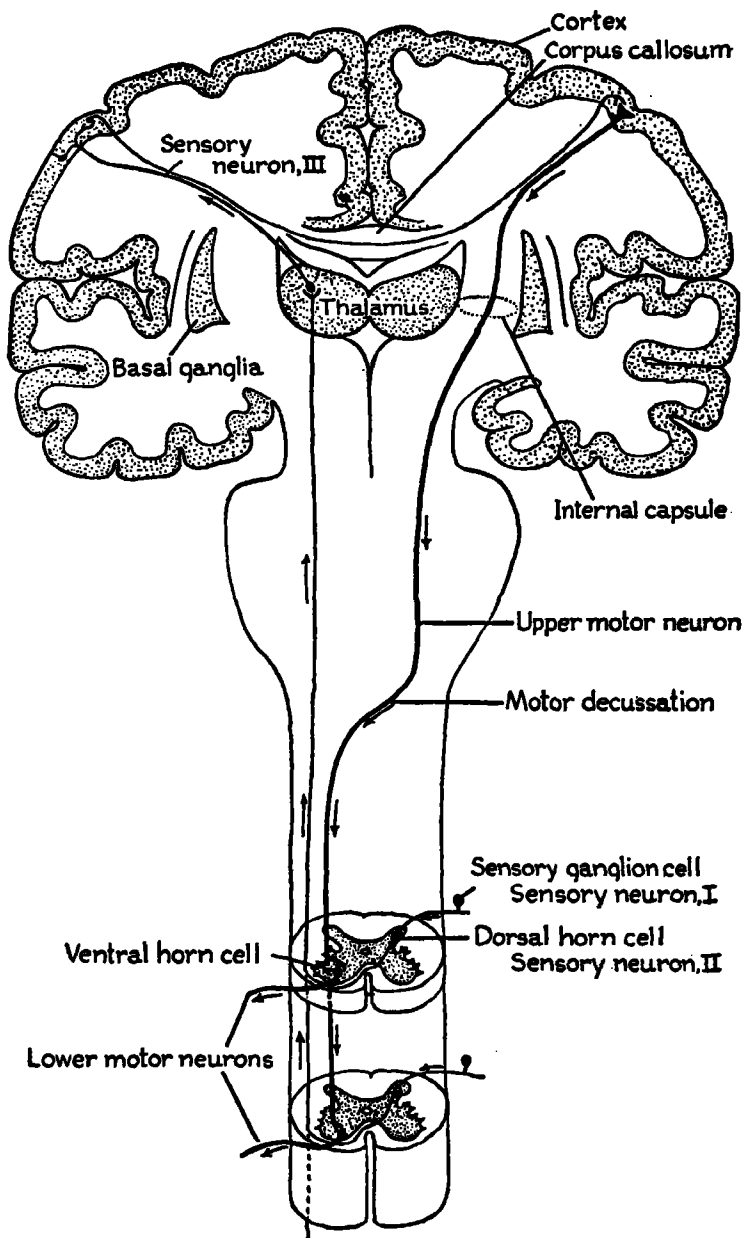


FIG. 40. Diagram of a sensory and a motor pathway. (Baillif, R. N., and D. L. Kimmel: Structure and Function of the Human Body, Philadelphia, Lippincott, 1945.)

car and train sickness. Swimming sensations, nausea, dizziness, illusions of objects which seem to be moving when they are actually

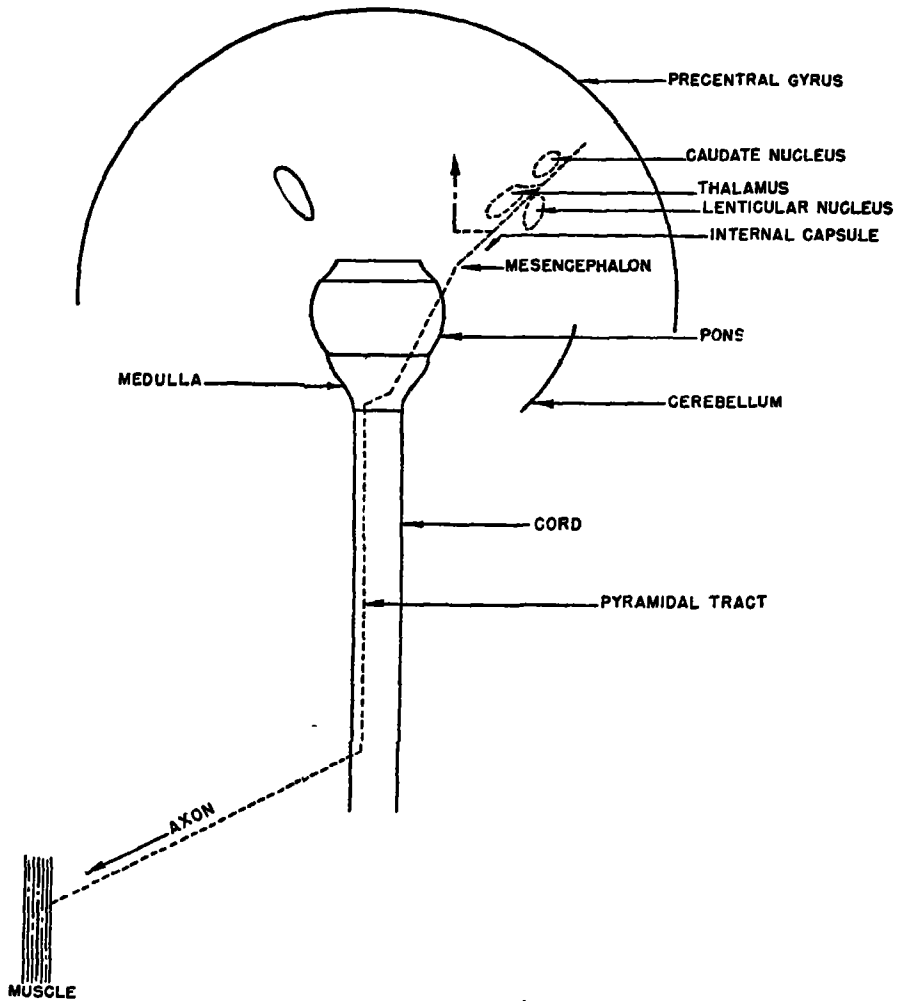


FIG. 41. Motor impulse cortex.

standing still, appear when perceptual experiences and illusions are improperly created.

Effective static-equilibric-labyrinth activity makes good sailors, good airmen, and good athletes. It prevents unnecessary accidents, maintains poise, and commands body and motor skills.

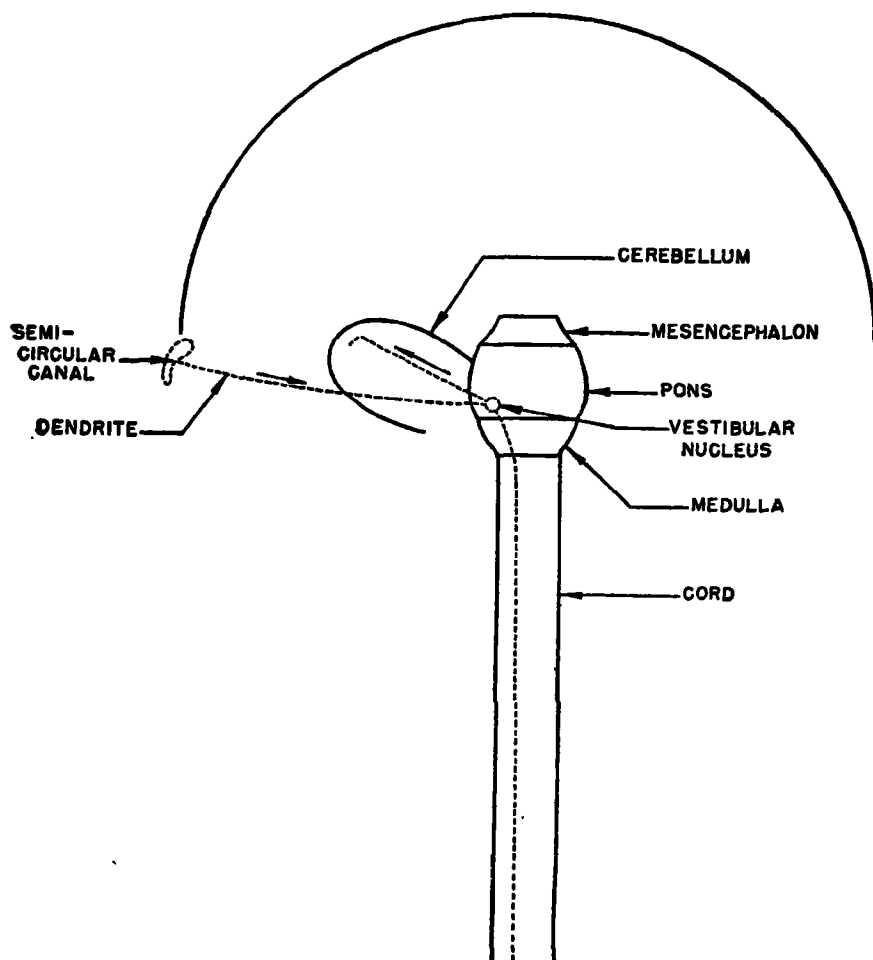


FIG. 42. Vestibular apparatus.

DISORDERS OF THE MOTOR SENSES

The Kinesthetic or Muscular Disabilities. Muscular disorders of the ordinary sort are expressed in erratic behaviors, such as exaggerated activity in alcoholic intoxication. In this and similar reactions there is a general failure to sense the accurate direction of the limbs. There are dizziness, hypersensitivity, excessively vigorous motor responses (hyperkinesis) and, conversely, subnormal vigor of

motor conduct (hypokinesia). Muscular disabilities always tend to create a distortion of the motor phases of sense perception.

The Static or Balance Disabilities. Often in normal individuals there is a tendency to assume unusual postural positions in walking, sitting, and in certain habits of working. The position of the shoulder or the head may be peculiar due to a prevailing organic indisposition. Disability of the static sense is very common in physical diseases which impair normal muscular reaction and balance. Dizziness or vertigo is characterized by severe whirling and giddy sensations due to overstimulation of the semicircular canals. Nystagmus, or spasmodic movement of the eyes, is evidenced by involuntary movements of the head with rapid oscillation of the eyeballs from side to side, or in rotatory action. This indisposition occurs often in the color blind. In normal individuals this disability is due to specific stimulations or conditions, and frequently affects individuals working in a dim light and a stooping position.

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ORIENTATION

Organic Sensation.

A. Visceral.

1. Thirst.
2. Hunger.

Psychological description—epigastric feeling.

B. Other intraorganic sensations.

1. Respiratory.
2. Intestinal.
3. Circulatory.
4. Sex.

C. Organic sense disorders.

1. Thirst—alcoholism.
2. Hunger—undue craving for food.
3. Intraorganic disorders.

10

Organic Sensations

INTEROCEPTION—THE EXPERIENCES OF THE ORGANISM

The organic sensations consist of experiences derived from the internal organs, from the tissues of the abdominal, visceral, and thoracic regions of the body. Little is known of the precise psychological reactions of these parts because of the inaccessibility of the *involved tissues*.

VISCERAL SENSATIONS

Organic sensations include such feelings as thirst and hunger, sensations associated with the intestines, and the respiratory, circulatory, and sexual sensations. Of all the intraorganic sense reactions, thirst and hunger have been studied most.

Thirst. The thirst sense has its sensory nerve endings in the mucous membrane of the throat and the posterior parts of the mouth. Insufficient water content in the cells of this region, together with the free nerve endings which arborate in and under the mucous surface, gives the physiological experience of thirst.

Thirst is said to be localized in the pharyngeal and buccal mucosa (cheek and pharynx), but soon becomes diffused throughout the mouth and throat tissues. The salivary glands support the experience, and the motor nerves (the ninth and tenth cranial nerves) proceeding to the pharynx and their sympathetic connections are also involved, the salivary glands being innervated by preganglionic fibers from the salivatory nucleus in the medulla.

PSYCHOLOGICAL DESCRIPTION. Thirst is indicated by the awareness or experience of incessant dryness, constriction, and stickiness of the inner surface of the mouth, the back part of the palate, the root of

the tongue, and the throat. Ordinarily thirst is occasioned by breathing, by hot air, by eating dry food, by speaking, and by excessive perspiration. It is more unpleasant than hunger, and if it persists unquenched it ends in delirium and death. Man can live for many weeks without food, but without water he cannot live many days.

Hunger. Hunger is mediated by nerve endings which arborate in the inner membrane of the stomach and related parts of the digestive tract. It is a complex of muscular pain and pressure in which the digestive organs tend to participate, creating a disagreeable ache. Contractions of the gastric muscles produce the feeling or experience of hunger.

The stimulation of the membranes, or their receptor cells, in appeasing hunger, occurs through chemical action in the stomach, aided by the pressure of food substance which relaxes the gastric musculature.

PSYCHOLOGICAL DESCRIPTION. Hunger may be characterized psychologically as an unpleasant, dull pressure, or feeling in the epigastric region. As the intensity of hunger increases it develops a gnawing, cramping distress which becomes pain. Intense pain in hunger is known as hunger pangs, and is proportional to the need of restoration and the maintenance of the body tissues. Vigorous physical exercise relieves hunger by inhibiting the contraction of the gastric muscles and the stomach walls. Strong emotional upsets abolish gastric contractions temporarily; smoking weakens the contractions and tends to delay hunger sensitivities.

OTHER INTRAORGANIC SENSATIONS

There are numerous qualities of organic experiences, frequently referred to in common speech but difficult to explain completely, and equally difficult to analyze. It is convenient to refer to these experiences as respiratory sensations, circulatory sensations, sex sensations.

Respiratory sensations are expressed as suffocation, stuffiness.

Intestinal sensations give a sense or feeling of fullness which arises in the stomach, intestines, bladder, through distention or the stretching of these organs, probably exciting the nerve endings. Normally the intestines are neutral but there are times when this

sensitivity asserts itself; it is common and variable in persons with a weak digestive function.

Circulatory sensations are indicated as shiver, goose-flesh, and "heart-in-the-mouth" experiences. In such reactions there is a probable contraction of the blood vessels.

Sex sensations may be added to this list of intraorganic sensations and declared as love in terms of sexual desire which should be elaborated and controlled by intelligence.

THE SIGNIFICANCE OF ORGANIC SENSATIONS

Intraorganic and visceral sensations function to indicate well- or ill-being in our physical organism which greatly affect man's basic physiology and his mental responses. The deep viscera, like the brain, are normally undisturbed by the sensibilities of pressure, pain, and temporal stimuli, but in sickness these organic parts are apparently very sensitive.

ORGANIC SENSE DISORDERS

Thirst and Hunger. The chief psychological disorder of the thirst sense is alcoholism, of the hunger sense overdue appetite and undue craving for food. Abnormally increased appetite (bulimia), results in excessive ingestion of food, eating beyond all reason. The abnormal craving for unusual kinds of food, as in parorexia, extends from normal craving to the eating of inedible substances, such as chalk, and even filth.

The reverse of the craving appetite is the converse situation in which the individual has an abnormally diminished appetite (anorexia), shown by the absence of the hunger sensation which causes a refusal of food. This disability may be acute as in the severe emotional reactions which undermine the normal habit of eating, but it may be a pathologic condition, frequently seen in mental patients. These disorders, and in fact all the disorders of the organic senses, are abnormalities of fundamental drives associated with reflex and instinctive behavior which are distorted and fail to express themselves in everyday adequacies.

Intraorganic Disorders. Of the intraorganic sense disabilities—the respiratory, the intestinal, the circulatory, the sexual—the latter is most conspicuous. Disturbances of the drive are expressed in the peculiar cravings and unusual sex practices. These abnormalities are usually anomalies of degree, such as frigidity (*anesthesia sexualis*), evidencing a diminution of the sex drive; of eroticism (*hyperesthesia sexualis*), which is an expansion of sex craving, and in its abnormal forms characterizes some unfortunate individuals as victimized by satyriasis in men and nymphomania in women, both of which are probably erotic insanities.

There are also abnormal behaviors which are anomalies of quality, such as autosexuality or auto-eroticism that usually results in masturbation, which when involved in mental conflict is most serious. Other qualitative disorders are homosexuality, fetishes, exhibitionism.

Homosexuality is sexual inversion. The craving is directed to a person of the same sex, manifested in various degrees. Some cases are relatively mild and negligible, for one can be homosexually minded without indulging in homosexual practices. Ordinarily, however, the homosexual man evidences marked effeminacy, and the homosexual woman shows unusual masculine traits of behavior and personality.

Fetishes, in the pathologic behavior, are characterized by an erotic attachment to certain articles of clothing worn by the object of attachment, which results in collecting these objects. A fetish may be so strong that it leads to criminal behavior; in any case it contributes to delinquency of one form or another.

Exhibitionism is a compulsion to display an erogenous part of the body, especially the sex organs, for the purpose of inducing sex excitement. It is an exaggeration of the sex drive, and with its counterpart, inspectionism, is gravely condemned psychologically, legally, and ethically.

• Much more could be said on these serious disorders with their psychological and social brutalities. It is enough to note that all of them impede the normal development of the ego and prevent the growth of the normal personality. Such behaviors carried by well-known characterizations, such as “inferiority feeling,” “superiority feeling,” “extreme self-assertion,” “self-display,” may proceed from this regrettable organic foundation, with its distorted ego. Rape and other sex pathologies may be motivated by a strongly distorted ego

bent on demonstrating an individual's superiority over others, and may lead to delinquency and crime.

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PART THREE

Learning

The general process of learning involves the activity of the basic sensory, adjustment, and motor mechanisms. It involves the operation of the various senses discussed in the previous pages, particularly the senses that we have noted under the sections called exteroception and proprioception. It is the task of the several exteroceptors to provide the basis of knowledge, the proprioceptors to achieve movement, and the interoceptors to supply adequate feelings. The gross result of this activity is the development of perception or perceptive response, which interprets the data of the senses. From perceptions memories are formed, for memory is mostly recalled perceptions, and these phases of psychology give the means of learning ability, tempered by feeling or the satisfactions of life.

Specifically learning is motor, verbal, and ideational.

ORIENTATION

It is necessary for every normal individual to apprehend the relationship between himself and his environment so that he may understand the world about him. The active senses of man give the groundwork for this knowledge, hence to know the world occurs by giving meanings to our sense reactions. Interpretations and understanding of these data of the senses are perceptions. By them we become aware of the meaning of objects and events in daily life, as they occur ordinarily in our physical environment. What does the following picture mean to you? Your response is a percept. It represents an interpretation of your sense reactions aided by previous habits of experience. Now turn the picture upside down, and note your perception.

Perceptions are formed by our psychological activities of observing, attending, discriminating, and recognizing phenomena. By these

means we combine and organize our sensory data and relate them to previous experience. It is important to observe accurately, to attend diligently, to discriminate carefully. These psychological skills are important in mental efficiency.

The following chapter discusses:

1. The development of perceptions by observing, attending, discriminating, recognizing.

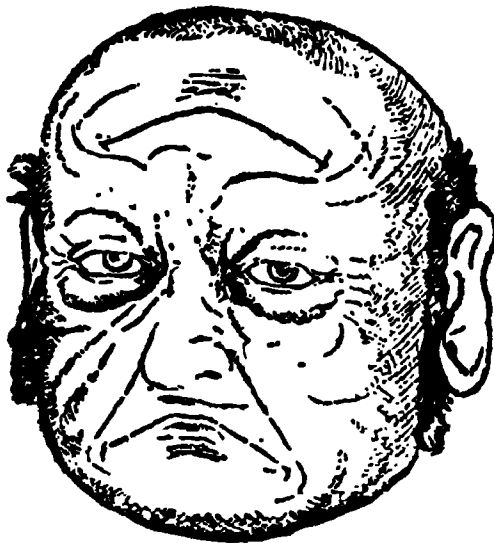


FIG. 43. Reversible picture.

2. It indicates the three major problems of perception as space, time, and movement.

3. It asks: How do we judge the position, direction, distance, depth, size, and the form of objects in space? It specifies the role of the senses in this important psychological reaction.

4. It asks: How do we know time? How do we know movement? Do we see movement or is it inferred?

5. Since perceptions are not always accurate the disorders of perception are enumerated under imperceptions, superperceptions, illusions, hallucinations, aphasia, agraphia, apraxia.

11

Perceptual Response

In the previous pages we have surveyed the bodily organism of man and his functioning senses. This physical stock-in-trade is the fundamental equipment for human living. We have noted how this organism is directed, determined, motivated so that it is capable of creating the common activities of daily life through the experiences of seeing, hearing, tasting, smelling, touching. These active external senses offer an avenue for the normal acquiring of knowledge. Along with these external senses we have glimpsed those parts of human physiology which are responsible for those abilities associated with our life of movement. To complete our sense equipment we have cited the organic senses which enable us to appreciate human feelings. Thus we have the threefold foundation of human life enabling us to know, to move, and to feel, built on the common senses of man. Now we must expand this foundation so that we may penetrate the larger sphere of our humanity and inquire how we come to understand, to ascertain meanings, and to interpret the data of the senses adequately. This task is initiated by a consideration of perceptual response.

THE PERCEPTUAL PROCESS

Objects in daily experience are gathered from widely different sources. They engage the receptor process, which involves the operation of the sense organs, sensory nerve avenues, and brain organization. In this normal activity impulses are unified, coordinated, and fused into perceptual or meaningful experience, which means that sense data are mentally understood. This interpretation of sense data, in its primary aspects, is the means whereby we gain knowledge of the external world. This knowledge depends on at least two factors: (1) present and previous sensory stimuli, and (2) the manner in

which the organism has reacted to previous and similar situations. Accordingly, the simplest kind of perception is **sensing**, which occurs through the interaction of stimuli and sense organs developing into simple or common meanings.

Perceptions as Meanings. As perceptual abilities develop into the wider experiences of daily life they become complex, and more is perceived than is actually presented to the senses. In this case highly developed meanings occur, as when one interprets a picture hanging on a wall. At first you see the precise sensory facts, such as lines, shapes, colors. The immediate sensory elements perceived are direct, but complexity and enlargement of the sensing are supplemented by psychological additions. This widespread psychological activity enables man to perceive the parts, relationships, and meanings of objects and events. Therefore, by the efficiencies of perceiving we are primed to act and forthwith begin to comprehend, to remember, to imagine, and to think. Hence, all forms of mental activity are more or less involved in the complex process of perceiving, and to this extent perception is the organization of sense data effected through their combination of past and present experience.

We have already seen, in the chapters on Vision and Audition, how the perception of objects seen and sounds heard proceed from definite bodily processes. We have also seen how they proceed from the stimulation of the receptors, continue in the transformation and modification of impulses in the adjusting nervous system, and in the patterning and repatterning of the impulses as they journey into behavior and conduct. By this complicated means man attempts to know himself and his world through the widely contributing factors in the physical environment acting upon his own physiological and psychological nature.

Direct Perception or Sensing. The direct perception of sensory impulses are the passive sensory processes in human activity. The structures of the body involved in perceiving undergo development from man's early life in childhood and normally continue to expand as life proceeds. As a consequence there are large differences in the perceiving abilities of the child and the adult. The infant begins with sensing, or direct perception, only. With growth the primary perceptions, or sensing, very soon are built into the higher forms of per-

ceptual complexity, otherwise known as indirect active perception. So there are in our adult experiences immediate and direct perceptions which expand into well-rounded complex perceptions common to our everyday interpretations and meanings of objects. It is this difference which accounts largely for the inevitable comparison of the mind of the child and that of the adult.

Complex Perception. Indirect or complex perception consists of the integration of sensations into meaningful wholes and involves active thought processes where simple facts are coordinated into larger meanings. Relations in life make our perceptions complex, carrying meaning far beyond the bounds of sensing. Parts are probably more simple and direct, wholes are psychologically complex containing fusions of direct experiences, hence in perception the whole tends to determine the part.

THE DEVELOPMENT OF PERCEPTIONS

We have noted that the physical basis of perception lies in the sensory elements that by themselves are meaningless, yet these elements constitute the groundwork through which mental activity emerges. Of these elements perception is dominant and fundamental. Accordingly, perception represents the apprehension of sense facts, such as sounds, odors, and temperatures, interpreted and well supplied with meaning. It is therefore necessary that our perceptions should be accurate, efficient, and effective.

Accurate Perception. Four groups of psychological factors are needed in the development of effective perception, which should occur without delay and with minimum errors. These are:

1. **OBSERVATION.** Observe the objects of sense closely and carefully.
2. **ATTENTION.** Attend to your tasks intimately.
3. **DISCRIMINATION.** Develop the ability to distinguish different characters in the multiple sense data that beset you.
4. **RECOGNITION.** Train yourself to recognize objects so well that familiarity with them makes perception immediate.

When these groups of processes are combined and integrated into a meaningful whole, sensory experiences are then organized into per-

ceptual patterns. These psychological factors do not necessarily function in logical order, for often one of them will be worked excessively, but generally they operate coordinately. A further word on these processes will be helpful.

1. **Observation.** Train yourself to observe objects closely. Observation is the dominant method of science and it should be duly in-

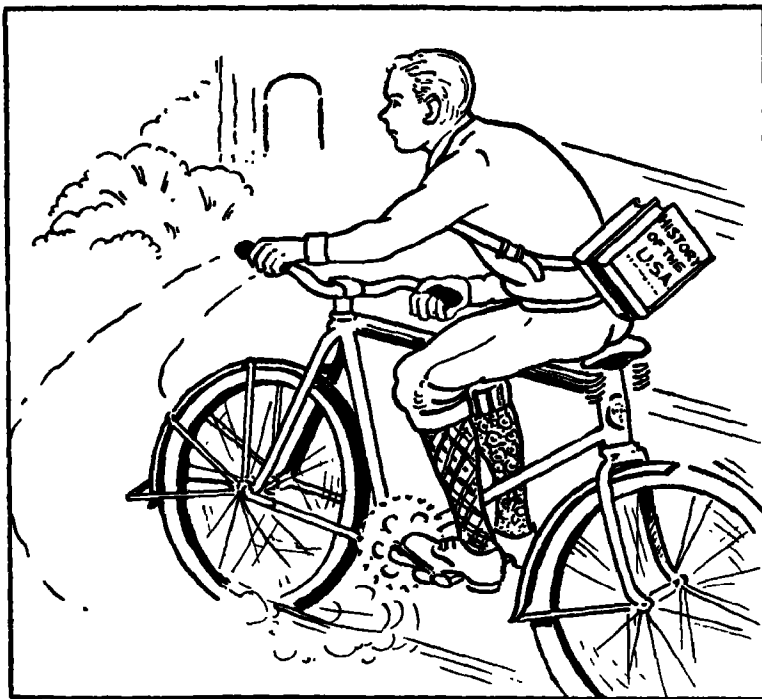


FIG. 44. A test of observation.

corporated into all our practice. It consists of the noting of phenomena as they naturally occur, and is thereby selective. Observation requires the accurate use of the sensitive receptors for efficient seeing, hearing, and the experiences of movement, touch, smell, etc. These senses register impressions on the nervous system and brain. This activity results in learning. Hence the relation between the external world and the "mind" of man is mediated primarily by observing.

Observation demands considerable effort and considerable bodily

activity—it is not a passive process. This fact makes perception an active reaction to some object or event, and the sensory-motor function is declared to be its physiologic essence. Hence, observation, to be of any value, must be explicit or clear and involve the adaptation of the adjustment process. It must observe things and events in their entirety or **synthetically**; it must observe things and events in their parts or **analytically**.

AN OBSERVATION TEST. Observe the accompanying figure of a boy on a bicycle and note that it contains certain errors. Observe the picture carefully for a couple of minutes, and you may find all the errors if your observation is extremely keen. The following mistakes in the picture should have been noticed:

Bicycle is going backward.

Bicycle has no chain.

Pedals are parallel instead of opposed.

Bicycle seat is over the front fork.

Bicycle handlebars are over the rear fork.

The left half of handlebar curves forward.

Boy's hose do not match.

Boy's book strap doesn't go around the books carried.

Book title is not on the front cover.

2. Attention. Train yourself to attend. Attending and observing are allied processes. To observe carefully is to attend, and both are preliminary acts of adjustment. Yet the act of attending has a specific purpose, namely to make the stimulus more clear and more distinct. It may be viewed in two ways: (1) as an adjustment of the receptors or sense organs, and (2) as vividness of mental experience characterized by clearness.

As an adjustment of the sense organs, attending is an objective act in perceiving. It consists of the integration of sensory responses toward the stimulating object whereby the physiological processes are adjusted to the external stimulation. This adjustment is made by means of directing the organism by such apparently simple motor reactions as turning the head, converging the eyes. Certain nervous and muscular processes and inhibition or partial inhibition of other neuro-muscular reactions are involved, depending upon activity within the brain. When such activity occurs an organization of per-

ceptual data results and the individual is in possession of specific mental facts. But no area of cortical localization can be mapped out for the attending process, although the psychological activity involved is expressive of a neural excitation that shifts momentarily from one part of the brain to another as the occasion demands. Some psychologists call this cortical excitement an **attention set**.

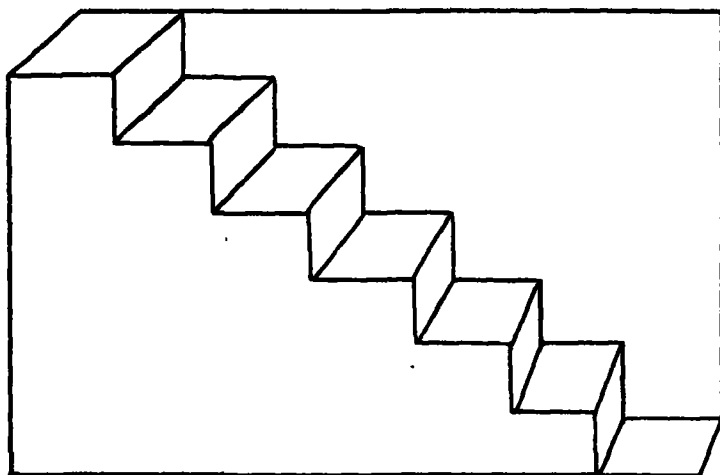


FIG. 45. Fluctuation of attention. (Note the changes that appear looking at illustration for one minute.)

Attention, as vividness of mental experience, occurs when certain factors of our psychological reaction occupy the center of voluntary effort. To support this view the method of introspection or self-observation must be relied on, since attention is regarded as the process which focalizes those sensitivities in the awareness of experience or consciousness.

Attention as an Empirical Fact. Notwithstanding the difficulties associated with the objective and subjective analyses of attention, everyone is involved in the habit of attending. Under what conditions, then, will an object or an event evoke attentive response-producing perceptions? What ordinarily attracts attention? What are forerunners of the attentive response? The answer is: **movement**—objects in motion; **magnitude**—extensities, large objects, size; **novelty**—new and uncommon events and experiences; **repetition**—

repeated stimulations of any kind until they become monotonous; change—changing stimuli, such as changing sights; intensity—bright lights, loud noises; interests—preferred interests; color. In such active phases attention thereupon plays a conspicuous role in developing perception phenomena.

3. Discrimination. Train yourself to compare and distinguish different characters within two or more objective data. Discrimination depends on the adequate functioning of the sense organs or receptors. Sometimes discriminative sensing is weak because of some sense disturbance. Decline, degeneracy, or injury of the sensory mechanism always leads to a disturbance of the perceptual function.

Discrimination, like observing, is selective but on a higher plane. It demands that the individual shall be able to make different responses to two or more objects. Aside from the sense factors involved, there are also elements of experience expressed as qualities, such as intensities, magnitudes, time, and position. In adult life this discriminative ability is highly important. It is fundamental to the effecting of precise reactions to situations, objects, people, words, standards, values, and its place in the building of adequate perceptions cannot be denied.

4. Recognition. Train yourself to recognize objects with familiarity. This phase of perception is more frequently referred to as an aspect of memory. It refers to past experiences now recognized as present and immediate. The sense mechanism recovers the past as though it were new.

Perceptual recognitions range from the indefinite to the definite, dependent on the use of time. Frequently we meet people and face situations that provide us with only a vague awareness of identity. Thus, in encountering an acquaintance, you may recognize him without being able to recall when you met and under what circumstances. If you remember when you met, the time factor aids perception immeasurably. However when you meet someone you have met before and do not recognize him, then your failure prevents adequate perception. Moreover, one may attempt to read a story a second time without realizing the fact, but after reading the first few pages may then recall when and where he had read it previously. So between the extremes of indefinite and definite recognition there are wide gaps in our perceptual experience.

THE PROBLEMS OF PERCEPTION

We have seen that perceptions are experiences which are primarily the result of sense reactions, and that in psychological interpretation they are patterns or forms of experience due to our immediate means of apprehending sense data. Attention has been called to the fact that perceptions are broader than the accumulation of combined sense reactions. Our perceptions, therefore, are complex mental acts. They combine the separate responses of sense with previous and like experiences, and thereby we say that we **know** the objects and situations in our environment. Hence the function of perception is to provide man with the meaning and interpretations of sense activities. Fragments of sense reaction are pieced together, missing portions are added, incomplete parts are filled in, sometimes extravagantly. So, the perception of things about us consists of added experiences beyond the range of our receptors to receive, and represents even more than our sense coordinations. Our task in life is to know the physical world about us, to manipulate ourselves in space and time, to move, to know objects in their size and form, and to do our daily work in the swing of effective rhythm. To put it more concisely, our main task of living is to know space, time, and movement, as far as it is possible. These three problems are the nuclei of perceptual knowledge, and are discussed briefly.

HOW DO WE JUDGE SPACE?

All objects are set in space and are involved in space relations. Among these relations are **position**, which involves distance and direction; **magnitude**, which includes size, volume; **form**, which involves magnitude, shape, structure, contour. Space is important in our understanding of life. We cannot cross the floor without recognizing its value, hence spatial factors represent man's adjustment to his physical environment. It is because of this physical relationship that we say that a thing is to the right or left, near or far away, above us, or in a certain place, and these estimations are perceived as position judged by the individual who is reacting to such objects.

Space is perceived by four important senses. The visual, tactual,

auditory, and kinesthetic senses that we have discussed in previous chapters now become important phases of our perceptual life and lead to knowledge or knowing. Probably the location of an object is best determined by vision which perceives size, shape, position, and movement of objects, aided of course by the related senses.

Visual Cues to Position, Direction, Distance, Depth. The position of an object implies nearness or distance. Its perception is mediated primarily by the muscular control or kinesthetic sensitivity of the movements of the eyes and the adjustment of the lens. In binocular vision the cue for distance is the muscular strain of **convergence** which is greater for objects that are near. When the visual sense explores an object that is near, the eyes tend to turn inward, the lens thickens or bulges. When the object is distant the lens becomes thinner, and the eyes are more nearly parallel to each other. This focussing of objects near and far is called **eye accommodation**. But the eye seems to play all kinds of tricks on us, and objects evade us; hence these primary space factors are necessarily supplemented by secondary space criteria, as noted in Chapter 6.

Near objects hide, or partially exclude, the view of objects that are farther away because of interferences in the foreground. In the line of vision objects are partially cut off by nearer objects, and **obstruction** gives a cue to distance. Nearer objects, by similar procedure, are more distinct and detailed than objects far away, and their **clearness** of outline gives a cue to position. The distance of objects on a flat surface, on desert, prairie, or ocean, is hard to estimate, but geometrical perspective, including the position of the object related to the horizon and the angles of its lines, provide a visual cue for distance. This secondary space criteria is called **superposition** and **angular perspective**.

In binocular vision the two eyes view the same object from different angles, and the separate retinal images do not actually coincide. The difference between these respective images gives the impression of **depth**. In monocular vision things near give **size** to the retinal image, as evidenced in microscopic and telescopic work. In binocular vision the nearer an object is to the observer the greater is its influence on the retina, and the greater the corresponding size of the retinal image. This secondary space criterion is known as **disparity of retinal images**.

Color phenomena are important as a visual cue to position, direction, distance, and depth. The colors of an object nearer to the eye are more vivid than objects at a distance, since colors fade when far away. Likewise, shadows on objects nearer to the eye are different in form and shape when compared with objects at a distance.

Tactual Cues to Space Perception—Position. An object in contact with the skin can be located fairly accurately, although the degree of accuracy varies with different parts of the body. A touch on the forearm feels different from one on the foot, and this qualitative difference has been called **local sign**, indicating the particular point of the skin which is being stimulated. Obviously, tactual localization is most accurate in those parts of the organism where the nerve endings are most numerous. Tactual pattern forms are perceived more adequately by the finger tips, the palms of the hands, and the forearm, in the order named. The feet and toes show relatively poor perceptual accuracy, but are subject to improvement by training and practice.

The perception of tactual relations of objects in space is not as conclusive as visual localization, but it is more accurate than auditory localization. The certainty of local signs in the various parts of the skin makes it easy to detect the place and source of skin stimulation, although the exact point of localization is less accurate. However, tactual stimulations, along with visual stimulations, offer our chief sources for a knowledge of space relationships. They give us knowledge of the shape and size of objects for things we touch, as well as see.

Auditory Cues to Space Perception for Depth, Distance, Direction. The distance and direction of a sounding body can be relatively well distinguished by the general nature of hearing and normal activity of the auditory mechanism. This auditory facility is due to the vibrational waves—amplitude, frequency, form, which rise to the experiences of pitch, loudness, and timbre. As was pointed out in an earlier chapter, sounds coming from the right or left can be well discriminated, but sounds coming from the front, the back, above, below, are less easily distinguished for the interpretation of direction.

DISTANCE is judged by the intensity of sound. If two sounds are of equal distance, differing only in intensity, the louder will ordi-

narilly be judged as nearer the observer. When two sounds are equally intense, but at varying distances, the nearer one is perceived as nearer and louder. Generally, however, the auditory perception of space is inaccurate and vague, unless the source of the sound is seen. Distance is, therefore, discriminated by loudness, which varies with direction, decreasing with the increase of distance between the hearer and the source of sound. Changes which produce auditory perception occur in the wave length and its characteristics, not in the vibrating object itself. They vary with direction and distance or depth perception. Pitch varies with distance. It is lower for receding sounds, higher for sounds that are near. Timbre variations occur with distance, depending on the relative intensity of the partials. In many sounds the higher and lower partials fade out with an increase of distance, which accounts for many mistakes in interpreting the true object of a sound.

Kinesthetic-cutaneous Cues in Space Perception. When the kinesthetic sense is stimulated cutaneous sense factors are usually also stimulated. Together they give spatial evidence about movements and objects handled. In such events the form and localization of objects are judged by moving the hands over them, and the sensations involved are a cue to their interpretation in spatial terms. Some degree of movement is always essential in order to give the sign of direction and orientation in space relations. Space gains kinesthetic meaning by motor manipulation—by walking the distance involved or by exploring an object with the hands. Hence, perception of distance and position are aided by motor habits. With eyes closed, allow a small object to be placed on the palm of your hand, and you will find that discrimination for form, size, and contour is difficult. If the object is moved or tactually manipulated it may be possible to determine its identity. Blindfold an individual and have him touch a specified object. Then turn him bodily a few degrees to the right or left, or completely around labyrinthically, and observe his motor reactions in attempting to locate the object touched. He will make different movements, largely chaotic, in his attempt to rediscover the object kinesthetically.

HOW DO WE KNOW TIME?

The perception of time, in general, is the integration of a number of events or experiences which consist of amount, rate, change, and order in objects which are experienced within the environment. We have come to know these integrations as time. Time exists in experiences which are apprehended in the present, as now. The present is vivid, the past is relatively vague, subsisting in memory, and the future is imaginary. Actually, the present alone is perceived since the past is revived as though it were the present.

Characteristics of Time. Temporal perceptions have two common characteristics or elements, namely: (a) **duration**, or continuity in time, and (b) **succession**, indicating that events follow one another in time and order.

1. **DURATION.** Time is continuous, events durate, they persist as they go on. This durative fact is a common characteristic of sensory reaction, and it is maintained until the total situation is changed in the physical event, as when the sunshine of the day is turned to rain. In such circumstances experiences endure and change, stop and start. Every psychological experience has a beginning and an apparent ending, and in this sense the perception of time is a mental event which represents the descriptive characteristic of mental time, hence the amount of change as perceived is duration.

2. **SUCCESION.** Succession represents change and discontinuity in experience. It depends on the discriminative ability of sensory impressions which form the wholes of present experience out of separate units. When events occur together they are integrated, unified, fused, act together, and function in a period of time which becomes a conscious whole, depending on the continuity of events in time to complete the psychological functioning.

Measurement of Time. Time is measured objectively by mechanical instrumentation. All of life is circumscribed by this medium, hence we are enslaved by the clock which measures time for us. But time, as measured by the clock's face is really a phase of space perception, where relations are translated into time. Yet, there are physical cues for time measurement, such as the physiological processes which are correlated with time. Among these processes are the im-

portant matters of hunger, heart-beat, respiration, sleep, fatigue, and rhythmic strains within the body.

Subjectively, time is estimated. It is judged by changes in experience or consciousness. When we are working diligently and are absorbed in a task we underestimate time, then we say that time flies because it seems shorter. When we are idling with little or nothing to do, and with no specific task, we overestimate time; then time drags because it seems longer. When you are vacationing, time passes rapidly. When you are ill, time drags, passes slowly. Time is illusory, as when an individual departs and we say that he has just left, when in truth considerable time has elapsed.

PERCEIVING SHORT AND LONG INTERVALS OF TIME. Short and long intervals of time relate to the mental attitude and experience of the individual rather than to the specific stimulus in the interval. Short intervals of less than 0.7 second tend to be perceived as longer than their actual physical duration, and the relatively longer times are perceived as shorter than they actually are. Time seems especially short when talking to a friend amiably for five minutes, whereas waiting five minutes for a streetcar seems long, as does the anticipation of a pleasant event.

Long intervals of time appear to depend more on the mental attitude of the individual than on the interval of the stimulus, where again the interval appears to be shorter when attention and feeling become absorbed. Long intervals are frequently tested by comparison, hence filled intervals are perceived as short, whereas unfilled or empty time appears long. Intervals either filled or empty, from thirty seconds to five minutes, have been discovered to tend toward over-estimation. Ten minutes filled with interesting material tends to be underestimated.

Reaction Time, or Speed in Perceptual Response. Normally man perceives quickly and advantageously. The driver of an automobile, for example, is called upon to perceive a situation without delay and with accuracy, but all men are not uniform in their responses; they differ markedly and their behavior is measured in intervals called reaction time.

How quickly do you perceive approaching objects, danger on the highway, an approaching friend, colors? How quickly do you hear, see, smell, taste? These questions are important in everyday life, for

speed is necessary for certain efficiencies. In the psychological laboratory speed of response is measured with a high degree of accuracy by special laboratory apparatus—a stimulus key, a reaction key, and a timing mechanism, usually a chronoscope. This instrument measures the unit in which the reaction times are expressed, and checks the time elapsing between the presentation of a stimulus and the response. Its real importance is easily translated into our daily tasks and routine efficiencies.

MOVEMENT

The perception of movement involves the support of space and time. Motion is perceived as a result of the successive changes in sensory stimuli. It is phenomenal, the continuous change of objects from one spatial position to another in periods of time. Accordingly, a moving object occupies different positions in space with regard to its surroundings in successive measures of time.

Do We See Motion or Is It Inferred? The perception that an object has moved, or is moving, occurs in several different ways, depending upon the particular conditions involved. First, we can perceive motion when the eyes are stationary and the object is moving across the retina, stimulating successive retinal points at successive intervals of time. These stimulations may be rapid or slow; if rapid, the points stimulated may be vague and fade slowly, if slow, the points should be clear and enduring. Second, we can perceive motion when the eyes are following a moving object, as when one is watching a departing automobile. Third, we can perceive motion when the eyes are stationary and the head moving, as when one turns his head to a near-by or far-off object.

Stimulus Patterns of Motion. Movement produces different stimulus patterns which engage the eyes, the ears, the organic and the motor senses. Movement is, therefore, complicated by many sensory cues, specifically visual, kinesthetic, auditory, and equilibric. Throughout life we have learned to make responses to specific stimulus patterns, and as a result we manipulate, bend, walk, and perform related acts of skill; we engage in recreational and athletic activities, such as running, jumping, throwing, kicking.

Dunlap¹ has presented four kinds of stimulus patterns of motion which should be noted:

1. **Change in position** of stimulus details on the sense organs. These changes are signs of motion, and also of position, and indicate speed or slowness of motor activity. Such changes in position may be illustrated by a moving ball which creates an image across the retina. The retinal image of the ball travelling across the field of vision changes its position in relation to other images which occur in the same event, and all the reactions of the retinal processes are details in the stimulus pattern which produces the perceptions of the moving object in its environmental setting.

2. **Change in Quality and Intensity.** Qualitative and intensive changes in visual and auditory sense data may be signs of motion. An approaching automobile at night gives a brighter and more intense light, its progressive brightness being a sign of movement. In the same way a sound that becomes louder may indicate the movement of an approaching object, as a ball travelling toward the eye becomes a progressively larger retinal image in visual activity. Shrinkage and expansion in the size of the retinal image thereupon indicate movement, and movements of the image crisscrossing the retina point to different directions of motion.

3. **Timbre.** Changes in the quality of sounds occur with the change of the stimulus when sounds change from front to back, from left to right, and these are signs of movement. Observe the conversations of a gathering of men, or women, in changing positions, in a social situation, a reception, and you will notice that sounds give cues to movement.

4. **Kinesthetic Activity.** Movements are perceived kinesthetically, aided by visual and tactual cues or signs, as in the case of the perception of direction. In this connection it is necessary to note that visual space perception is necessary to give a perception of position, otherwise change alone will occur. When the visual aid is absent we may know that the object has changed but we do not know where it actually is.

Three Kinds of Motion. Continuing with Dunlap's position three sorts of motion have been distinguished, but often they occur con-

¹ Knight Dunlap, *Elements of Psychology*, p. 272.

jointly. First, motion may consist of the total body activity of a person, as when he walks or turns around. Second, motion of a part of the body may occur with respect to other parts of the body, as when he bends his knee or arm, or turns his head. In such movements one or another part of the body moves in reference to the environment. Third, motion of one or more objects in the environment may occur with respect to other parts of the environment which are considered as being quiescent, such as an apple dropping from a tree.

Illusions of Motion. If an object moves too rapidly it is perceived as a blur. In this perceptual event the retinal lag causes the images to overlap. Some objects move very rapidly, such as the spokes of a wheel which are not discernible in motion. Here the retina is insufficiently or ineffectively stimulated to create adequate response for details. Hence, the perception of motion, like all other phases of perception, is subject to error. Errors in motion are common in all behavior from the simple acts of walking to the complicated feats of athletics and trained skills. Nonetheless, perceptions of motion may be cultivated so that increasing accuracies of response may be promoted and maintained. Illusions, then, are inaccuracies of motion, and there are three major kinds, namely: (1) failure to recognize motion at the time of stimulation, (2) false perception of motion before it has occurred, (3) the mistaking of one motion for another. Two common illusions well known to everybody will serve to illustrate.

THE MOVING TRAIN ILLUSION. This common illusion occurs when sitting in a train, automobile, streetcar, waiting for it to depart. Beside the train is another train seemingly stationary. It begins to move slowly, and you appear to be moving in the opposite direction, or you appear to be moving and the other train appears to be stationary. This illusion is usually provoked by a visual pattern, with more or less kinesthetic, tactual, and visceral accompaniments. When there is a jerk or a jolt the kinesthetic sensitivities are involved. In any case the illusion is vivid.

MOTION PICTURES. We seldom think of the "movies" contributing to our pleasure mainly through the visual illusion of motion, but this is decidedly the fact. Motion pictures are a succession of still pictures presented at a rate of 16 to 24 per second. The moving picture

is produced by the rapid stimulations of successive points on the retina by stationary units. What reaches the eye is not a continuous movement from the screen but a series of pictures presented in rapid succession perceived as continuous motion. This phenomenon is commonly called the cinema illusion, or phi phenomenon. Since these pictures were taken of moving objects at successive intervals of time, they are progressively disparate retinal points. Motion is always related to a fixed point of reference, usually the position of the observer, and always involves many complicated conditions.

DISORDERS OF PERCEPTION

The disorders of perception proceed from the disorders of sensation and their predisposing neurologic relations, from insufficiency of perception, and from complex and false perceptions. The following are important perceptual disabilities:

Imperception. Imperceptions indicate an inadequacy of perception, or a complete absence of perception. In this difficulty sense data fail to arouse the impression and their essential associations and meanings are necessarily absent. A breakdown in neural functioning has occurred and the means whereby perceptions arise is incomplete or missing, usually in one sense department, as in mental blindness or mental deafness. The necessary stimuli fail to create apprehension, and meanings do not exist. The object is seen but it means nothing, as in so-called "word-blindness," or alexia, where the printed page is nothing more than a mass of black lines or marks on a white background. This disability may be due to organic lesions or disassociations in the neural physiology involving the sensory areas of the brain.

In mental deafness, as in mental blindness, sounds have no meaning because the individual cannot identify them. Some are just sounds, as they were in the individual's infancy. There is no elaboration of the sensory currents in the brain because the nerve paths do not function, or they are impeded in their function and specific and meaningful impressions are not aroused.

Besides imperceptions in the visual and auditory sense fields there are similar disturbances in the tactual and kinesthetic responses:

astereognosis. In this case the individual cannot identify objects by touching or manipulating them. In taste and smell it is the same, objects that are not properly sensed give no perception, no meaning.

Superperception. In superperception one sense is much stronger than another, giving unusual powers of perception for the excessive sense. There is an extraordinary elaboration of neural functions within the nervous system and sensory areas, and this may account for many unusual behaviors. It may be behavior of the genius type manifested in excessive imaginations, offering what we think is a neurotic brand of conduct. Imaginations assume a super-form; the individual may be excessively visionary, possibly abnormally inventive, and queer.

Illusions. Some illusions are normal because the perceptual errors are recognized. When errors are not recognized as errors and are reacted to as though the misrepresentations were genuinely real, then the illusions are not normal and the perceptual response is open to criticism. In this case a tree gives the appearance of being something altogether different, such as a man or an animal. Often the hearing of voices in creaking doors, noises that apparently have no legitimate source, are illusions. Suggestions, feelings, habits of thought are inappropriately aroused. Nerve impulses function in wrong channels and synaptic resistance is high and difficulties of adequate perception are inevitable.

Hallucinations. Hallucinations are gross errors in perception. They read facts into a present sense when there is no relevant stimulation, and differ from normal illusions which are simply erroneous perceptions of present sense data. Hallucinations give a perception when no external object exists. In this fact an hallucination is an extreme form of illusion, and likely to be pathologic, characteristic of the individual, and colored by his profound nervous and mental condition. Hallucinations may occur to any of the several senses—seeing sights that do not exist, hearing sounds that are false, touching objects that are not there. They are common in mental disease, and are not infrequent in severe fatigue, in physical illness, in hypnagogic states as when one is drowsy and dreamy between waking and sleeping.

Visual hallucinations bring in false perceptions of absent friends,

animals, angels; they are common in dementia and related deteriorations. Auditory hallucinations present actual "voices" experienced as meaningful or otherwise, and "voices" within the individual, one accusing and the other protecting him. In kinesthetic hallucinations the individual seems to be moving when he is actually still, he seems to be speaking when no such movements are taking place, the floor appears to be collapsing beneath him, or things in the room appear to be moving as in alcoholic intoxication. There may be hallucinations of food as when a patient finds it difficult to taste and smell properly. In whatever form an hallucination appears the disturbance is serious and if possible should be checked as to whether the cause is physical or mental. They always interfere with a normal life of feeling, creating emotions that may eventually lead to crime or other excesses.

Organic Impairments. Complicated sense disorders manifest themselves in major impairments of the perceptual processes and denote rather serious defects. When, for example, injuries occur to the brain, to the nervous system, or to the sense organs, difficulties of speech and disabilities of the motor system may result. In this respect aphasia, agraphia and apraxia are typical.

APHASIA. Aphasia is an impairment of language ability. The individual cannot speak or is disabled in the speech function. This affliction may be due to faulty visual or auditory activity, or it may be due to imperfections within the brain, impeding perceptual adequacies.

AGRAPHIA. In agraphia there is a probable disintegration in the brain processes and its contingent motor equipment, and the individual cannot write ordinary words. A failure to synchronize the brain areas and coordinate the various sense factors such as the visual, tactual, and kinesthetic prevent exercising the skill of ordinary writing.

APRAXIA. In its general form apraxia indicates the loss of ability to perform ordinary skilled movements; agraphia is but one of these defects of movement. In its sensory form apraxia characterizes inability to use simple tools; in motor apraxia the individual comprehends the import of the task but lacks the ability to do what he knows should be done.

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ORIENTATION

As you live you learn, and memory is indispensable to life. Test your memory efficiency. Ask yourself: How well do I remember the technical names in psychology? How well do I remember names, faces? A good memory enables you to master the mechanical details of your work. Therefore, at all times seek to retain, remember, and recall in order that your daily program shall not fail. The chapter discusses:

- I. Memory as a Physiological Process.
- II. Memory as Perception.
- III. How Are Memories Formed?
 - A. By stimulus-response behavior.
 - B. By acquiring sense data, sense perception.
 - C. By recalling perceptions.
 - D. By arousing learning effects.
 - E. By individual characteristics.
- IV. Memory as Retention.
 - A. Test of retention is reproduction.
 - B. Retention has a time element.
- V. Memory as Recall.
- VI. Forgetting.
 - A. Why do we forget?
 - 1. Inadequacy of stimulus.
 - 2. Poor initial fixation.
 - 3. Retroactive inhibition.
 - 4. Character of material.
- VII. Can Memory Be Improved?
 - A. Better habits of study.
 - B. Improve perceptive abilities.
 - C. Practice recall.
 - D. Physical fitness.
 - E. Overlearning.
- VIII. Disorders of Memory.
 - A. Amnesia—loss of ability to recall.
 - B. Paramnesia—false recollections.
 - C. Hypermnnesia—exaggerations and exaltations in memory.

12

Memory

Memory is one of the oldest topics in general psychology, and probably the most popular discussion in the psychological field. From the earliest days of experimental psychology it has been a common subject of investigation since it is concerned with the retention and recall of sense data. The modern conception of memory specifies it as a form of mental habit systems which include memories for each of the sense perceptions. The normal individual has a memory for things touched, objects seen, sounds heard, and so on for every sense activity. So we should more properly speak of **memories** rather than memory, because memory is not a single element but a complex factor of mental activity.

MEMORY AS A PHYSIOLOGICAL PROCESS

The term memory was originally used to designate a faculty of mind capable of retaining ideas and reproducing them when wanted. Memory, today, in psychological usage, consists of a number of psychophysical processes more or less closely interrelated. These processes are objective characters in the reacting physical mechanism and specifically within the sense organs and their contiguous neuromuscular functioning, which result in impressions made on the physical structure and capable of recall. In this regard, memory in its fundamental aspects means the facilitation of certain paths of sensory discharge, which, with practice, function as habits within the neural tracts. This neural activity, issuing in memory, depends on cerebral action or the healthy functioning of the brain. In diseases which affect the functional activity of the brain there is a partial or total loss of memory. Loss of memory often accompanies

a cerebral shock and may persist for years, rendering the individual incapable of adequate retention and recall.

MEMORY AS PERCEPTION

It should be noted that perceiving, remembering, imagining, and thinking represent the high reactions of the stimulus-response process; they are psychological processes of the higher order involving both the reacting organism and the awareness of mental experience. Accordingly, memory is the organism's ability "to turn round upon itself," as F. C. Bartlett in *Remembering* (1932), has declared, which means that organic ability is able to bring from itself that which has been implanted by sense activity.

Perception requires the observation and motivation of a present stimulation within a present situation; it interprets the object or part of it as a present response or reaction. Memory, understood as remembering, permits the recall of perceptual data that are not immediately present to the senses. In this respect memory is a sort of intellectual device for the rearousal of facts acquired by observation, and the ability to recall and enumerate. As such, memory is probably the most common mental experience of man, unchallenged by any psychological fact unless it be habit. Without memory we could not operate our toils and tasks for a solitary day. Events and facts must be remembered from hour to hour, from day to day, over long and short periods of time, if knowledge is to be assured. Hence, when we carry over the experiences of life from one period of time to another we **experience** the fact of remembering.

HOW ARE MEMORIES FORMED?

Memory Is Stimulus-response Behavior. Remembering regarded as a neural act or event involving the adequate activity of the senses with their receptorial function, makes memory a product of the stimulus-response process. Thereupon, memory depends primarily on the efficient functioning of the receptor-effector mechanism, which in turn depends on the adequate stimulation of the sense organs and contiguous neural connections.

Memory Is Acquisition. In every act of remembering two necessary stages occur, namely, acquiring and recalling. These two stages really represent learning in its broadest outline because they involve what has been learned. If we add retention and recognition to these stages, as is common, we mean that to retain signifies that the event or information is held through the process of acquiring and is ready for recall.

Memory Is Recalled Perception. Building on the physiologic factors already stated, memory reactions occur when sense data are interpreted and understood; then perceptions are formed and experienced as mental impressions. The more intense the stimulus, the more vivid should be the impressions. Impulses aroused within the nervous system are conserved as bonds or connections among neurons in the central axis, and are called traces. When these impulses are strong then perceptions are deep and clear, and such perceptions are potential memories.

Memories Arouse Learning Effects. The characteristic fact about memories is that they reproduce: they do not create. They rearouse acquisition by reasserting the function of previous stimulus-response patterns, reproducing according to demand some item out of the past that is required to fill a present need. Accordingly, memories represent neural motor set and mental set, in either the mechanical responses of the organism, or their products in terms of perceptive abilities.

Individual Differences in Memory. Everyone knows that the recall of memory data, such as names, facts, events, do not occur with equal ease either in the individual himself or in different individuals. Recall difficulties are due to psychological and environmental conditions and circumstances which are relatively hard to locate with precision. Memory, then, is an individual ability, which indicates that one can reproduce only in line with his physical ability and his psychological habits.

MEMORY AS RETENTION

Retention is the capacity of the organism to retain the effects of past sensory activity. It represents the after-effect of an excitation, called either a response or an experience which persists over a period

of time, and signifies the holding on to what has previously transpired. Just how the organism retains these impulses we do not exactly know. For a long time physiologists and psychologists have wrestled with this question; they have sought for the organic basis of retention but with little success. We know that retention is dependent on brain activity, and that it is presumably a feature of the integration of neural action. Shaffer¹ states that "an act of acquiring probably causes changes of some kind in the nervous system that permit the connection of a stimulus to a certain response. These modifications persist, and are the physiological correlates of retention. The neural changes are the same as those underlying habit formation and other forms of learning." Pillsbury² proposes that retention is either in the mind and retained in the form of conscious mental states, or that it is a property of the nervous system.

Mechanism in its physiological aspects, while fundamental, is not adequate completely to explain remembering. If memory were mere automaticity of habit, drill would suffice. It does not however, for one can repeat items many times and yet not remember. Therefore other facts are needed to make remembering more psychological, and probably these are in the process of recall. Nonetheless, retention is shrouded by performance and ability in the higher levels of neural integration.

The Test of Retention Is Reproduction. The usual test of retention is the ability to reproduce or reinstate a previous sensory pattern or part of it. Precise reproduction is rote memory where original material is retained and reproduced mechanically without the necessary meanings being known. Everyday reproduction may be verbal, which is usually spoken of as recall; it may be reconstruction, and the redoing of a set of movements. Often it occurs for part of a previously integrated experience only, with additions derived not for the specific event but from contemporaneous circumstances.

Retention Has a Time Element. Retention is not the storage of sense data, not a "filing" of sense experience, it is a condition of the organism and a maintaining of attitudes whereby the organism deals with a present event or circumstance on the basis of conditions which served it in the past. In that circumstance events represent a fact

¹ Shaffer, Gilmer, and Shoen, *Psychology*, p. 332.

² W. B. Pillsbury, *Fundamentals of Psychology*, p. 332.

of behavior in the human tendency to go back, but this behavior serves the present and the future. R. H. Wheeler ³ maintains that "one remembers best those items of experience which fit in with attitude, interest, or goal regardless of the amount of repetition which these items have received." But as time passes retention fades, and recall becomes less distinct. Happenings of a few hours past are relatively clear, but they soon become less clear. Intervening events and activities interrupt the efficiency of memory and contribute to forgetting.

MEMORY AS RECALL

Recall is the arousal of the memory image of a previous event or act by processes which involve the revival of previous impressions. These revived experiences were originally perceptions. An image is hard to describe but it is an empirical fact which we all experience. Boring ⁴ declares it to be a "subjective perception-like" experience that occurs in the absence of the original stimulating circumstance. All of our sensory acts issue in these mental activities that stand out as pictures in our "minds," which can be recalled and expressed. If we did not possess this facility, our psychological efficiency would be immediately impaired and we could only know what is now present with no regard for the past and with no imagination for the future.

FORGETTING

Forgetting is the loss of the ability to recall, a partial or complete loss of impressions made at a previous time. There is a universal tendency to forget, yet it is amazing how much knowledge man can retain. If the amount of knowledge forgotten is extensive, or if the rate of loss is high, it can be reduced with effort, patience, and industry.

Rate of Forgetting. The rate of forgetting, as will be seen by the descriptive curve which follows, is very rapid at first and then tends to slow with the advance of time. It is estimated that approximately two-thirds of the material learned is lost during the first two or three days. Forgetting is natural, it is a law of nature. It is important be-

³ R. H. Wheeler, *The Science of Psychology*, pp. 290-291.

⁴ E. G. Boring and collaborators, *Psychology. A Factual Textbook*, see Chapter 14.

cause many facts and events must be forgotten to ensure human efficiency. If we remembered everything that our senses meet life would be unduly weighted with mental impedimenta.

A curve indicating the rate of forgetting was introduced in 1885 by a pioneer psychologist, Herman Ebbinghaus, who experimented on his own memory-function using nonsense syllables, which are artificially constructed combinations of letters, usually three in

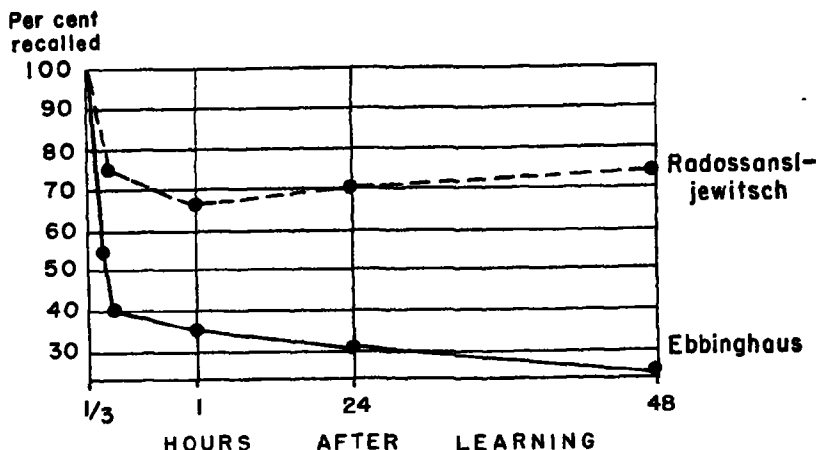


FIG. 46. The curve of forgetting.

number, that can be readily pronounced but which do not represent a meaningful word. Later another psychologist, Radossansl-jewitsch, produced a curve of forgetting, and both curves have become historically classic. They are reproduced in the accompanying figure.

It will be observed that forgetting and retention are in inverse ratio to each other in any unit of time. The abscissa of the graph represents the units of time elapsed, and the ordinate represents the corresponding units of memory performance. Various factors influence the formation of the curve, such as the kind of material that is to be remembered, the physiologic condition of the subject, the psychological attitudes and the relative disposition of the subject, negativisms, and inhibitions.

Why Do We Forget? Neural impressions created by an act of learning remain intact for a length of time characteristic of the individual and the particular task. The impressions therefore are

subject to certain metabolic changes in the tissues, previous learning in whole or part has been functionally lost, and we forget. Illness, physical injury, impairment of organic condition, cerebral shock, all affect memory to a large degree, and extreme cases frequently result in the dissociation of personality.

The chief reasons for forgetting in ordinary everyday behavior may be enumerated. They are normal and natural, but they should be overcome.

INADEQUACY OF STIMULUS. Every memory is a sort of habit formation involving stimulus-response reactions, and every receptor involved must be properly stimulated. Therefore, in order to secure effective retention and recall the memory habit requires adequate stimulus. If something is read hastily or carelessly, if an instruction is given too rapidly and not clearly heard the stimulus is defective and memory performance is impaired. We forget easily because we have not received the full measure of stimulation.

POOR INITIAL FIXATION. Retention is proportionate to the degree of sense activity in fixation whereby the mental habit is established and the effort of concentration spent in learning. Fixation in this event means the directing and focussing of the sense or senses that are used, usually the eyes and ears, upon the object under consideration. So, in creating good impressions there is not only adequate stimulation but good physical fixation also.

RETROACTIVE INHIBITION. Interferences, interruptions, interpolated activity, intervening forces of behavior, and periods of mental inactivity that occur between learning and recall tend to establish forgetting when retroaction is unfavorable. Just as proper repetitions effect retroactive facilitation, similarly unfavorable conditions are retroactive in an inhibitory way. Retroactive inhibition, or the effect of an act or experience upon retention, tends to disintegrate the original impression since one event may cancel another. This type of behavior is a very common form of forgetting as when a duty occupies our mind but soon is obliterated by other tasks.

CHARACTER OF THE MATERIAL TO BE LEARNED. Less meaning in the material read, studied, or heard, means more forgetting. Less pleasantness and interest in the material likewise lead to forgetting since we always seek to forget the unpleasant; this is a human and social economy. Long and difficult material is often retained better than

short and simple material because more effort is given to such kind of learning. Accordingly, work done with a minimum of effort is very likely to be soon forgotten.

CAN MEMORY BE IMPROVED?

No one doubts the practical value of memory. It is indispensable to life, for a good memory means ability to recall at will. But can it be improved, and more particularly can a poor memory be made better and more effective? As in learning, memory is not a thing like a muscle that grows with use and exercise. It is not a magical capacity which can be touched with the wand of fortune. It is not a thing, but a performance.

Of the various procedures that have been popularly favored for the improvement of memory some are virtually useless, and the best have their limitations. To improve the memory-function, however, some few things may be said categorically:

Develop Better Habits of Study. This advice is good for all people, students and laymen alike. The organism can always be brought to a better and higher degree of efficiency through the development of carefulness in observing our tasks, for better habits of study are not confined to the classroom, they are or should be co-ordinate with life. But to the student these words are trenchant: Try to learn better. Be more orderly, more cohesive in acquiring knowledge, and the memory performance will show better results.

Improve Perceptive Abilities. Practice careful observing, attending, discriminating, and recognizing, and you will forget less.

Practice Recall. Be persistent, rigidly exact, relevant in every recall habit and effort. There are no psychological secrets possessed by memory trainers that are not far-outweighed by proper psychologizing. Recall large sweeps of information often.

Keep Yourself Physically Fit.

Overlearn. Learn thoroughly and well and far beyond the initial reward of recall. Overlearning is extravagance of effort, it is relearning even when you are aware that you know.

Use Several Senses. Do not rely on one sense alone in memory work. Supplement your visual sense by listening even to yourself.

Say the words (auditory), write the words (kinesthetic, tactual, motor) for by doing so learning is facilitated.

Impressions. Acquire clear impressions of the data of the senses. Nothing is remembered unless the impressions are clear, vivid, and capable of permanence. Impressions which are best remembered are new, startling, frequently repeated, most recently acquired. Make multiple associations, for impressions are made effective by establishing more associative bonds. To gain a clear impression it is always necessary that you understand the material before you, and the more familiar it becomes the better your impressions should be.

Keep Psychologically Fit. Avoid accidents and events that impair body-health, avoid fatigue and exhaustion, avoid worry and fear, and seek always to maintain a briskness of animated thought.

DISORDERS OF MEMORY

There are three principal types of memory disorders: amnesia, or the general deficiency of memory; paramnesia, or misremembering and often referred to as false recollection and falsification; and hypermnesia, or excess and exaggeration of memory in which there is unusual ability in recall, frequently pathologic. Ordinary forgetting is universal, for things that have served their purpose should be forgotten in the interests of mental economy. But there are facts in our daily lives that must be remembered. When they are too frequently forgotten and the loss is excessive, the disorder is proceeding toward the pathologic.

Amnesia. Amnesia is the loss of the ability to recognize and recall. It is caused by defective fixation within the perceptual process involving both the sense organs and the brain, or an inability to evoke and reinstate previous perceptual impressions. The impressions have not been fixed because of distractions, inattentions, or loss of neural plasticity. In advanced disorders the damage may have been done by organic lesions and cerebral concussions, atrophies, and accidents. Ordinary amnesias may arise from faulty observation, physical fatigue, sickness, emotional perturbations and shocks, drug stimulations, mental disability or deficiency. By reason of this inadequacy of impression meaningful associations are lacking, retention does

not function, and recall is impossible. Some things we try to forget, and we should, such as painful, terrifying, excessively disturbing events. They linger submerged but their painful consciousness tends to pass. If they are not completely forgotten they may disturb behavior in the conflicts of conduct-producing neuroses.

Pathologic Amnesias. The pathologic amnesias may be temporary or permanent, partial or general. General amnesias are observed in feeble-mindedness, senility, and the psychoses. Partial amnesias are occasioned by illness, accident, conflicts, phobias; they may be temporary and periodic, or permanent. Some partial amnesias are limited in time, or restricted, affecting remote or recent happenings. Some events preceding a shocking or critical circumstance may be entirely forgotten; this condition is a retroactive amnesia and is called retrograde amnesia. Sometimes events that follow a critical circumstance obliterate the memory; they are called retroanterograde amnesia.

In temporary amnesias, due to emotional stress, exhaustion, fatigue, deliria, injuries, or mental disease, lapses of memory occur and may return gradually or suddenly, consistent with the nature of the individual and his recovery from the particular circumstance. Sometimes memory losses slowly grow more extensive, as in the anterograde amnesias of old age with its senility, oncoming mental decline, or mental disease such as dementia, paresis, and even aphasic disorders. Senile demented often have the uncanny characteristic of remembering situations that occurred early in life, but their recollection for recent happenings is faulty. They are, by the very nature of the disorder, childish, reverting to the fancies and memories of childhood.

Paramnesia. Paramnesia is misremembering usually characterized by false recollections which give the condition the stigma of falsification. Truth is distorted because of unwholesome memory illusions. In extreme cases facts are reported which never occurred. Fancies, delusions, and undue suggestions are confused with realities, imaginary additions to partial facts may be created on old memories, and lost memories may be replaced by false ones. Behaviors of this kind are always troublesome and dangerous to truth. When they occur in the states of fatigue, in emotional instabilities, in childhood and

immaturity, serious misunderstandings are made; in mental deficiencies and in neurotic and psychotic patients they are indicative of abnormality and often introduce the ridiculous. Persons with pathologic paramnesias revel in fabulous fabrications which indicate illusory memories with their unbelievable reports.

Hypermnesia. The exaggerations of hypermnesic disorders show an exaltation in memory. The remarkable products of literary, musical, and mathematical prodigies may fit into this category. Yet this condition is noted in individuals of the euphoric and excitable emotional class. Hypermnesic memories may occur as a result of drug stimulation, in alcoholics, and in certain diseases. Some drugs tend to produce excessive visions, extravagant ideas and imaginations. But the same or similar reactions occur often in idiot savants and psychotics. Hypermnesia is often responsible for outstanding memories for facts, faces, music, dates, which in most people is cultivated by great effort. It may be characteristic of individuals with a mental deficiency or deterioration but who have a talent for special memories. In such cases it is frequently linked with illiteracy, for many illiterates have remarkable powers for rote recall, when the content of the recitals is not even understood.

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ORIENTATION

- I. Feelings—organic sensations conveying affective tone.
 - A. Organic basis arising from:
 - Metabolic changes.
 - Chemical action.
 - Absent substances.
 - Diseases.
 - B. How are affects felt?
- II. Emotions—expressed feelings, motorized in conduct.
 - A. Emotional patterns.
 - B. Primary and secondary emotions.
 - C. Development of emotional behavior.
 - D. Conditioning the emotions.
 - E. Three fundamental emotions.
 - Fear.
 - Anger.
 - Love.
- III. Sentiments.
- IV. Theories of Emotion.
 - A. James-Lange theory.
 - B. Cannon's peripheral theory.
 - C. Cannon's central theory.
- V. Disorders of Emotion.
 - A. Feeling excesses.
 - B. Diminution of feelings.
 - C. Perversion of feeling.
 - E. Emotional frequency.
 - E. Emotional narrowness.
 - F. Emotional excess.

13

Emotion

Emotions are affective states, widespread bodily responses, which comprise all the human feelings and give to any moment of life its glow, its pleasantness, or its depression. **Feelings** are organic qualities, organic sensations, that convey affective tone to human attitudes. Our perceptions, memories, and even thinking draw their sources of energy from the external world and are charged by feeling tone which is either pleasant or unpleasant. In this manner the affective experiences of man consist of feelings, moods, passions, temperaments, sentiments, and emotions. **Feelings** are internal organic reactions. **Moods** are relatively mild predispositions or products of an emotional reaction. **Passions** are strong uncontrollable emotions. **Temperaments** describe the typical character of emotional responses which are important in the development of the individual's emotional attitudes. **Sentiments** are combined intellectual and affective states. **Emotions** coordinate all of these affective experiences and express the feelings by muscular and motor behavior and describe man's passing or permanent disposition. Unlike the intellectual or cognitive experiences, which are concerned with responses primarily dependent on external stimuli by objects external to the body, the emotional life is the result of internal energies within the organism.

FEELINGS

Feelings, characterized by pleasures and pains, by apathy, or excitement, give foundation to the emotions. So we speak of pleasurable emotions, painful emotions, apathetic emotions, tense emotions, which are so common in human life.

List of Feelings. It is difficult to give an accurate list of the human feelings. In addition to the six affective experiences, mentioned previously, some writers include the following affects:

- | | |
|-----------------|-----------------|
| 1. tension | 9. satisfaction |
| 2. suspension | 10. tenderness |
| 3. depression | 11. revulsion |
| 4. fatigue | 12. suffocation |
| 5. relaxation | 13. nausea |
| 6. relief | 14. dizziness |
| 7. exhilaration | 15. hunger |
| 8. malaise | 16. thirst |

Some of these terms are inadequate because of their diffuseness and probable overdescription. They will, however, show the magnitude of human feelings and indicate the importance of the experience.

The Organic Basis of Feelings. Feelings as affects are data of the organic senses, dependent primarily on physiological action but not definitely localized. They are diversified and proceed from the visceral receptors, the alimentary canal, the stomach, lungs, heart, blood vessels, generative organs. Feelings may be stimulated by any mental processes, especially the sensational, the intellectual, the volitional, or all of these combined.

Affects may arise from numerous physiological conditions. The following are the most important:

METABOLIC CHANGES. The biologic organism is influenced by certain metabolic changes which occur within the cells of the nervous system. Efferent currents are discharged in the nervous mechanism to the smooth muscles in the alimentary canal, blood vessels, and genital system where they set up changes that are powerful determinants of behavior. Various metabolic products, such as carbon dioxide and lactic acid, produced by muscular energy, arise within the tissues and affect the body.

CHEMICAL ACTION. Chemical substances operating especially in the visceral region increase tonicity in the alimentary canals, causing adrenalin, glycogen, and thyroid secretion to oxidize in the muscular system through the action of the hormones in the ductless glands and create affects. A corresponding acceleration of blood circulation with increased respiration and increased bodily temperature is evidenced in feeling. In certain emotional excitement there is always increased chemical secretion, especially in the adrenal glands, which are most important in the operation of the body for motor efficiency.

It is well known that the individual may perspire when angry or excited. The heartbeat is faster and respiration is increased; the face may become flushed, tears may gather. States of depression or hilarity (as when one is sad or glad) suggest that the physiological mechanism is in a high state of functional activity when life is colored by any affective behavior.

MUSCULAR ACTION. Strain, relaxation, fatigue are probably caused by action within the striped muscles, and feelings are aroused. Hence, a muscular characteristic is in frequent evidence in all emotional activity, in work and play, and feelings necessarily emerge.

EXTERNAL SUBSTANCES. Substances of external origin, such as stimulants, narcotics, sedatives, irritants, depressants, drugs, poisons, create affects. These substances have been conveniently grouped into vegetable, mineral, and animal qualities. The vegetable is illustrated by opium, alcohol, caffeine. The mineral includes arsenic, lead, etc. The animal consists of insect bites, venom, and so forth.

ABSENT SUBSTANCES. A lack of calcium, iodine, vitamins, insufficient oxygen, insufficient water, and the like, may produce affective conditions and indicate feeling deficiency.

DISEASES. Disease has a decided influence on the affective life, and hunger, thirst, dizziness, nausea, add their unmistakable feelings.

How Are Affects Felt? Feeling is a response condition, a special sort of sensing with no specific receptors, although it is known that the bipolar neurons of the autonomic system, the spinal ganglia, and related ganglia in the brain-stem represent a probable medium of feeling. These neurons send their axones to the smooth muscles, to the connective tissues throughout the body, and to the epithelia, as found in the linings of the stomach and the hollow organs. Here the sensory terminations are stimulated.

Woodworth¹ has declared that it would be easy to find a hundred words that could be used satisfactorily to complete a sentence beginning, "I feel ——" He presents an illustrative list, which follows, the first word in each line indicating the type of feeling involved and the corresponding emotional expression:

1. Pleasure, happiness, joy, delight, elation, rapture.
2. Displeasure, discontent, grief, sadness, sorrow, dejection.

¹ R. S. Woodworth, *Psychology*, 1934, p. 334.

3. Mirth, amusement, hilarity.
4. Excitement, agitation.
5. Calm, contentment, numbness, apathy, weariness, ennui.
6. Expectancy, eagerness, hope, assurance, courage.
7. Doubt, shyness, embarrassment, anxiety, worry, dread, fear.
8. Surprise, amazement, longing, yearning, love.
9. Aversion, disgust, loathing, hate.
10. Anger, resentment, indignation, sullenness, rage, fury.

EMOTIONS

Emotions are feelings expressed and motorized in conduct. They are widespread bodily responses which comprise all the human feelings that give to any moment of life its pleasantness or its depression.

Use of the Term Emotion. The word emotion has never been used in an exact way, probably because there are so many different emotions. In brief, emotions represent total responses which are highly complex and highly variable. Dockeray calls emotion "a disorganized response," being uncertain, unpredictable, and diffused throughout the body. Shaffer ² presents emotion as a disturbed condition manifested in three ways: (1) As overt behavior involving changes in the effectors, which are the muscles or glands, easily observed by another person, as when one is manifestly excited and acts vehemently. The angry person shows excessive muscular tension, clenches his fists, grits his teeth, frowns. (2) As involving internal changes in the vital organs of the body. Breathing is heavy, the heart thumps, the pulse is rapid, and blood pressure increases. Changes in the vital organs indicate a disturbance of organic processes. (3) As conscious experience, meaning "a peculiar sort of conscious experience," signified by the awareness of confusion, irritation, incoherence, restlessness, unlike the normal forms of adequate and dependable experience.

Emotional Patterns. Human behavior is characterized by many familiar words which indicate that life is well-stocked with emotional patterns. Many of these patterns sink to the measure of obsessions; at other times and in normal situations they are modified by the con-

² L. F. Shaffer, et al., *Psychology*, 1940, Chapter 6, especially p. 138 ff.

trol of man's intellect. The major emotional reactions that we know are commonly referred to as:

Fear	Excitement	Love
Rage (Anger)	Delight (Elation)	Sorrow
Jealousy	Joy	Grief
Hate	Patriotism	Sympathy
Contempt	Zeal	Pity
Disgust	Awe	Lust

This list is not an attempt to classify the emotional patterns in the order of their importance; it is a statement of emotional possibilities. In many of these emotional behaviors the individual's overt response is inadequately adapted to the normal situation—he is beside himself. In other behaviors, as in joy, sorrow, etc., the emotional behavior is a temporary adaptation and therefore normal in view of the situation.

Primary and Secondary Emotions. Attempts have been made to distinguish primary and secondary emotions. McDougall⁸ listed primary emotional qualities as follows, and showed the accompanying instincts for each of the qualities:

EMOTIONAL QUALITIES	ACCOMPANYING INSTINCTS
Fear (terror, fright, alarm, trepidation)	Escape (self-preservation, avoidance, danger instinct)
Anger (rage, fury, annoyance, irritation, displeasure)	Combat (aggression, pugnacity)
Disgust (nausea, loathing, repugnance)	Repulsion (repugnance)
Tender emotion (love, tenderness, tender feeling)	Parental (protective)
Lust (sexual emotion or excitement, sometimes called love)	Pairing (mating, reproduction, sexual)
Distress (feeling of helplessness)	Appeal
Curiosity (feeling of mystery, of strangeness, of the unknown, wonder)	Curiosity (inquiry, discovery, investigation)

⁸ W. McDougall, *Outlines of Psychology*, 1923, p. 325.

EMOTIONAL QUALITIES	ACCOMPANYING INSTINCTS
Feeling of subjection (of inferiority, of devotion, of humility, of attachment, of submission, negative self-feeling)	Submission (self-abasement)
Elation (feeling of superiority, of masterfulness, of pride, of domination, positive self-feeling)	Assertion (self-display)
Feeling of loneliness, of isolation, nostalgia	Social and gregarious instinct
Appetite or craving in the narrower sense (gusto)	Food-seeking (hunting)
Feeling of ownership, of possession (protective feeling)	Acquisition (hoarding instinct)
Feeling of creativeness (of making, of productivity)	Construction
Amusement (jollity, carelessness, relaxation)	Laughter

Secondary Emotions. The attempt to define secondary emotions arises from the probable blending of the primary emotions to form a more complex emotional response. Accordingly, the emotional behavior of scorn may be a blend of anger and disgust. McDougall offers the following as further examples: contempt, loathing, awe, horror, admiration, reverence, gratitude, reproach, envy, resentment, embarrassment, shame, jealousy.

THE DEVELOPMENT OF EMOTIONAL BEHAVIOR

Emotions, usually, have a common and undifferentiated beginning in infancy from which later forms take their patterns, characterizing the individual in any moment of stress. They are built on basic human feelings which at first are simple and seemingly natural. As they persist in life, deeper expressions are manifest. As an example, jealousy founded in love changes during adolescence and adulthood, growing with the circumstances of the years. It is difficult to tell from an infant's behavior what emotion is mani-

fested. Usually the infant's emotions are interpreted by adult experiences, which may be gross misrepresentation of the actual emotional fact, yet the foundation is laid in the earliest years.

Conditioning the Emotions. The conditioning of emotions is prominent in developing emotional behavior. Why are some children, some adolescents, and some adults afraid of dogs, mice, thunderstorms, etc. Why do some people become excited when spoken of slightly? Why do some people stir disgust within us, create antagonisms even before we speak to them or know them? These emotional responses have been conditioned, they have been learned by the methods of the conditioned reflex, by associating stimuli. Almost any stimulus may be connected to an emotional response by the process of conditioning. Ordinary situations of life that usually pass by with little or no notice produce the same effects of emotional behavior through the process of conditioning. Many social and verbally conditioned emotional responses, such as fears—of snakes, lightning, contagious disease—occur through the fear of others now imposed on an innocent subject, and may develop into a lifelong habit.

Emotions May Be Reconditioned. According to reflexologists and behaviorists, all of life consists of the conditioning and the reconditioning of emotional and allied behavior. When conditioning results in adverse behavior it may be reconditioned by a process of relearning. In such cases it is necessary to associate a new and better situation or circumstance, create a new internal or external situation-response pattern that is more pleasurable and substitute it for the adverse emotional behavior. In such a manner it is claimed that a new behavior may "sprout" and new conduct result.

THREE FUNDAMENTAL EMOTIONS

Watson⁴ suggested there were three fundamental emotions, namely: fear, rage, and love. After a period of experimentation he found that infants are not afraid of animals, that fear responses were conditioned early by sudden stimuli, that rage and anger responses were conditioned when bodily movements were thwarted, and love responses conditioned by anyone who cares for them, feeds them, fondles them.

⁴ J. B. Watson, *Psychology*, 1924, p. 152.

FEAR

The most common emotion is fear. It is emotional behavior characterized by a feeling of unpleasantness, a state of nonadjustment with relatively low usefulness. Some fears appear to be normal, and consist of experiences which ordinarily startle man, such as intense, sudden and unexpected noises and uncommon experiences. Such fears are frequent in child life. When they persist in adolescence and adult life they create a response pattern in which perception and thought are limited. Man normally fears accident, disease, catastrophe, personal injury. The thought of such things develops strong organic changes within him which affects his mental integration.

Allied to fear are the unpleasant reactions of distress, grief, and disgust. Distress causes mental suffering. Grief enables the individual to recognize loss, injury, and the like. Disgust is an emotional attitude characterized by unpleasantness, expressed in strong dislike for other's habits, a loathing of sickening sights, of foul odors, of displeasing circumstances.

Fears Are Individual. There is no common pattern for the expression of fear. The outward forms are individual and various. Sometimes fear may be sudden, sometimes it may develop slowly and continue long. It may produce excitement or depression. It is an acquisition, not a birthright, notwithstanding its early appearance in human life. Were it not for extenuating circumstances it is possible that man might grow into his world without a sense of fear, but civilization has ruled otherwise. Man knows about the past, he can imagine the future, he can anticipate and plan. This ability to reflect, to recall, and to imagine may point adjustively or it may point non-adjustively; in the former case man may avoid fear, in the latter he generates a disposition to fear.

Abnormal Fears. When fear becomes exaggerated and extreme it is called a **phobia**, meaning a strong fear, manifested usually in connection with a harmless situation. Such morbid fears characterize the psychopathic personality. It is possible to list over a hundred phobias that harass the individual severely. The following is a partial list:

Acrophobia: the fear of high places
Agoraphobia: the fear of open places
Algophobia: the fear of pain
Astrophobia: the fear of stars (thunder)
Anthropophobia: the fear of men, or some particular man
Claustrophobia: the fear of closed places
Hematophobia: the fear of the sight of blood
Monophobia: the fear of solitude
Nyctophobia: the fear of darkness or dark places
Ochlophobia: the fear of crowds
Pathophobia: the fear of disease
Phobophobia: the fear of fear that one will be afraid
Thanatophobia: the fear of death
Toxiphobia: the fear of being poisoned
Zoophobia: the fear of animals

ANGER (RAGE)

We have observed that fear is a prominent characteristic of man, yet, despite its disabilities it may serve the purpose of self-preservation. Many a life has been saved by abandoning one's rights and maintaining a sagacious sense of fear, when high caution is necessary. Anger appears to be different, because it is a disintegrating force of both mind and body. It seems to stand out from all other emotions. Aristotle called it "an awful tempest of the soul." Anger is expressed in scores of words in our language, and it forms the basis of a large collection of drama.

Anger and Fear Compared. While fear is a more or less defensive excitement with a disposition to escape the situation by running away, or hiding, anger is more positive. Anger shows itself as ready to attack or struggle with conditions, by setting the jaw and baring the teeth. Anger is a reaction of the offense type, usually elicited by an interference with activity, and takes form in annoyance observed in countless ways. In the long history of man, anger has prompted him to defend himself, to guard his property, protect his reputation by offensive methods. No one can justly condemn this kind of effort

when there is cause, for human life demands it in every peril and crisis in order that man may be fortified against oppression and loss.

Rage. Rage is intense anger, accompanied by violent facial and bodily expressions. It, too, is stimulated by sense data that obstructs, interferes, and restrains activity.

~ LOVE

Love is the feeling or sentiment of attachment toward some person, exhibiting a variety of psychological and physiological manifestations. In infancy love is attached to food reactions. Caressing, patting the face, and stroking the body generally bring forth gurgling and cooing responses in the infant and indicate earliest loves. From this kindly affection the infant grows into the love responses of childhood which are vital to the development of personality. These affections are basic to happy relationships and social developments.

In adolescence, and in the adult years of human life, love expressions are more specific. In adolescence the emotional responses are acute, often accompanied by a lessened ability for intellectual concentration. The love-reactions are built on the affections of early life, on the developing sex-mechanism, and on social factors that inevitably take the form of a natural behavior on which life depends for its biologic progress.

SENTIMENTS

Sentiments represent emotional dispositions which refer to an object or person. They are probably acquired, occasioned by an emotional situation through which a degree of emotional behavior may be expressed, but without exhibiting the true characteristics of an emotion. Dockeray⁵ regards sentiments as "the result of emotions conditioned with some object or situation, which have become habits of emotional response of the milder type." More than likely sentiments are combined experiences consisting of affective attitudes surcharged with intellectual bearings, as will be seen from the following list of illustrations: (1) the patriotic sentiment—which is the development of many experiences in life. The patriotic individual esteems the place of his abode, his country, and his nation. The

⁵ F. C. Dockeray, *General Psychology*, 1932, p. 227.

patriotic sentiment therefore consists of love of self, of family, of social activities and institutions, idealized and fused into an affective pattern of response. (2) Family sentiments, which are expressed in love—the love of a mother for her child indicates tenderness. When the child is in danger the mother is excited (emotion), she hates what endangers the child. If the child is threatened the mother is angry, if injured she is sad, depressed, grieved. (3) Ideals of justice, the discrimination between right and wrong, are largely sentiments which result from emotional as well as other experiences of the individual.

THEORIES OF EMOTION

The popular conception of emotion is that conscious states are the direct consequence of the perception of the affective stimulus, and that physiological changes proceed from the affective consciousness. This older view explained emotional events arising immediately upon the perception of the object, as an accompaniment of consciousness leading to expressive movements.

The James-Lange Theory. William James, the early American physiologist, psychologist, and philosopher, in 1884, and Carl Lange, a Danish physician of the last half of the 19th century, in 1885, in independent studies, proposed a new view of emotion which has remained a classic theory in psychology. James insisted that physical actions follow a perception, and that emotional states of consciousness are concomitants of these actions. Both James and Lange held that the perception induces visceral, circulatory, and skeletal motor reactions which send nerve impulses to the brain, and the perception of the impulses is identified with the emotion. To illustrate, the perception of one's physical changes during escape from a frightening object creates the emotion of fear, so, we are afraid because we run, afraid because we tremble, angry because we strike, and not that we run, tremble, strike, because we are afraid, angry. This theory assumes that visceral and muscular patterns exist for each emotion. James asserted that bodily reactions proceed from sensory and neural changes but that emotions do not occur until excitations within the peripheral processes have reached the brain. Thus certain reflex movements within the nervous system lead to bodily changes, mostly

within the viscera, the skeletal muscles, and the circulatory system, which account for emotional experience. Hence, the bodily changes create the emotion, and the emotion is the result of bodily change.⁶

Cannon's Peripheral Theory. W. B. Cannon, the renowned American physiologist, investigated the function of the autonomic nervous system in emotionalized behavior. It was known that the vital processes—respiration, digestion, circulation—were regulated automatically by the autonomic system; thereupon Cannon and his co-workers included emotional responses in the autonomic category.

Cannon contends,⁷ from his animal experimentation, that when the sympathetic division of the autonomic system functions it operates as a whole. It acts to accelerate the heart, increase blood pressure, and alter the tension of the involuntary muscles. Besides this action the sympathetic system has a number of relationships with the ductless glands which are psychologically important. Among the glandular changes which follow, or are dependent upon the functioning of the sympathetic division of the autonomic system, particularly in excitement and related changes, there is increased action of the adrenal glands which express themselves as emergency efforts in time of crisis. At such times adrenalin is poured into the bloodstream, the sympathetic system is augmented in its action, chemical and physiological changes occur, and the organism is prepared to battle for its continued existence. Cannon has shown in his experimentation with animals that the strong emotions such as fear and anger are made possible by the emergency action of the sympathetic system. Its interrelated parasympathetic system (the cranio-sacral fibers) acts in the milder emotional responses and serves as a check to the more intense sympathetic behavior. When this experimentation was applied to man in his complex surroundings the adrenalin stimulus stirred up bodily states but no actual emotion was noticed. This conclusion led Cannon and his co-worker Bard to investigate the role of the brain in emotional response.

Cannon's Central Theory. Further experimentation with animals disclosed a close relationship between brain and thalamus. Cannon and his co-workers found that when the sympathetic division of the

⁶ See William James, *Principles of Psychology*, Vol. II, p. 450.

⁷ W. B. Cannon, "The James-Lange Theory of Emotions: A critical examination and an alternate theory," *Amer. J. Psychol.*, 1927, 39, pp. 106-124; also *Bodily Changes in Pain, Hunger, Fear, and Rage* (1929).

nervous system had been removed the animal continued to show emotional response to stimuli. Thereupon he isolated parts of the brain of a cat, leaving the cerebrum and thalamus intact, and it was indicated that the thalamus was essential for the cat's display of rage in the presence of a dog, and other emotional excitement. The thalamus appeared to be more important than the cerebrum, and gave evidence of strong emotional reaction. Strong emotions, he believes, consist of a functional relationship between the thalamus and the cortex with its intervening nerve impulses. Sensory activity in the receptors activate especially the thalamus and thereby induce muscular changes, which is a reversal of the James-Lange theory. They create a kind of crude consciousness which is reenforced by the cerebral cortex, producing powerful responses we know as emotional experience.

DISORDERS OF EMOTION

Emotions may be unusually intense or unusually weak, as when an individual is oversensitive, or very docile and demure. One individual may be liable to intense outbursts of anger, and another may experience no anger at all, hence extreme emotional instability shows in undue variability of human feelings and their expression. Emotional behavior, like severe temper, may come quickly because of excessive emotional sensitivity and lack of emotional organization and control.

Disorders of Feeling. Generally feeling disorders are combined with emotions and drives that are complex; they are seldom found alone. Briefly they may be enumerated as excesses, diminutions, perversions.

FEELING EXCESSES. Feeling excesses take the many forms of exaggerated feelings of pleasantness and unpleasantness. Excessive pleasantness is frequent in alcoholics with their happy-go-lucky optimism, and exaggerated feelings of unpleasantness are frequent in individuals with a depressive outlook on life. In neurotics these feelings are common since they are the victims of fatigue, tension, and excitement. The intensification of feelings is noted in their flights of ecstasy, in their stupors, and in their moments of false exaltation. The underlying cause of this distress may be due to general organic indispositions, or to marked reenforcements or inhibitions within the

nervous mechanism. Frequently feeling disorders are occasioned by worthless habits and general psychological disorientation.

DIMINUTION OF FEELINGS. In contrast with the intensity manifested in feeling exaggerations there are persons whose feeling-life is characterized by apathy and indifference. Their feelings are low, or conspicuously absent as when an individual is unmoved by joy or sorrow. This condition is frequent in the early stages of mental disease, specially dementia praecox where interests and aversions are reduced to a low ebb. Schizophrenics have neither pride nor ambition. But this apathy may seize the normal individual in the throes of physical illness, in fatigue, in trouble, in mental shock, and in worry. In such an event the feelings appear to be numbed and ineffective. Some individuals lack the "tender" emotions, they are capable of aggressive acts but are wanting in kindness, in generosity, and in considerate feeling for others. If they are not criminals they are potential candidates for criminal behavior.

PERVERSION OF FEELING. Degenerate and base feelings offer a pathologic or semi-pathologic alteration of the fundamental affects of man, due in all probability to a dissociation between feelings and ideas. There is no organized integration, hence an individual will laugh at sad news and weep at good news. Ascetics, cynics, confirmed "grouchers" belong in this class. They find pleasurable experiences in the distinctly unpleasant, just as many of them find deep satisfaction in the various kinds of martyrdom. Their enjoyment of false humiliation is not unlike the masochists of Freudian fame, if sex behavior is left out of the reckoning. They simulate the adverse smiling and laughing of dementia praecox patients who behave in this manner without cause.

Disorders of Emotion. The emotional disorders of the ordinary man are associated with emotional frequency and change distorted by situations and circumstances. Most individuals have a characteristic emotional level which is representative of their general behavior. To see the involvements of frequency and change one need only ask: Are my fits of anger, my excitements, my eroticisms so frequent that they are uncontrollable, or controlled only by hard effort and unusual care? To put the question in another way: How do you face success or failure, praise or blame? Does failure stir

you to new endeavor, or does it command you to give up the struggle?

EMOTIONAL FREQUENCY. Some people have frequent emotional upsets. The slightest provocation sets them off. This high emotional potential is yet more viciously effected by a rapid alteration of moods in which the individual is now mad and now glad. Elation changes to depression and back again, therefore the individual cannot be depended on in the many normal situations that demand a balanced expression of feelings. This emotional malady always interferes with human efficiency and prevents social advance.

EMOTIONAL NARROWNESS. It is a characteristic of human nature that many objects arouse an individual's interest; the same is true of the emotional life. But some people lean too heavily on one more or less isolated interest and play their emotional tune, as it were, on one string. It may be a dog, a cat, a love novel, a sex interest or perversion or fetish, a select but single friendship, a religious faith. Adequate emotional responses should be broad and tolerable, big and bountiful, fitting the individual to enjoy and benefit by the varieties of common life and developing useful emotional patterns.

EMOTIONAL EXCESS. Some people behave with great emotional demonstration. Their conduct is gushing with great spread but it may be most superficial. When it is insincere it is open to real criticism and may indicate a false emotional habit.

Emotional excess is a characteristic in all fears, especially the extreme fears or phobias. It is characteristic of anger. General anger is intense irritability or irascibility. Some normal people are habitually quarrelsome. They are victims of chronic suspicion, always trying to "get even" with other people for small and negligible annoyances. They achieve delight in exercising emotional extravagance. Anger reenforces their pugnacious drive, and when it is repressed it causes malicious revenge. A strong habitual personality of this kind simulates the behavior of many psychotic people, especially the paranoics. Many, if not all, of these emotional extravagances are conditioned responses. They have been acquired by an inappropriate stimulus which has become substituted for the original feeling. Some vivid experience has brought the two stimuli together and wrought the damage which is emotionally learned.

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ORIENTATION

Specific learning is necessary for man's survival and human progress. Every aspect of our daily life shows the effects of learning. Fundamentally learning is threefold: (1) motor skills must be acquired, (2) verbal material must be learned, (3) ideational values must be comprehended.

The chapter introduces learning as a specific factor in human life as follows:

The Nervous System and Learning.

The Laws of Learning.

Human learning by (a) conditioning responses, (b) by trial and error, (c) by perceiving, (d) by doing, (e) by remembering, (f) by learning to solve problems, which is learning to think.

14

Learning

Human learning is essentially an active process which consists of the organism making proper responses to stimulation. It involves changes induced by behavior within the living organism. Learning is not a separate function of mind or body but a coordinate process which includes the acquisition of skills, adequate feeling, the formation of habits, and the development of sense perceptions into voluntary acts of adjustment to life in its many and varied human situations. Living and learning are allied processes and should be mutually enriching. Habit formation, motor activities, perceiving, imagining, remembering, associating, thinking are therefore aspects of learning, and must be organized into efficient patterns of response. All of these factors bear on the individual's daily behavior and serve some definite function in human living. Accordingly, learning in the broadest view includes every aspect of psychological response; it is a process of producing changes in the organism.

More specifically learning is (1) the acquiring of new modes of response to a motivated situation; (2) the acquiring of skills and knowledge; and (3) the modification of responses so that they result in the formation of adequate habits. Acquisition specifies the establishment of new stimulus-response connections within the nervous system, and modification describes learning as a change which has occurred within the organism, especially in the neural synapses, occasioned by environmental influences.

THE NERVOUS SYSTEM AND LEARNING

It appears to be conclusive that learning depends on the degree to which the nervous system is developed. This development indicates the capacity and plasticity of the organism to modify be-

havior. The synaptic functions in the nervous system and activity in the higher cerebral centers give foundation to the mechanism of learning. Exactly what happens in this nervous organization is not adequately known. It is more convenient to explain learning in terms of total behavior, hence whatever occurs within the neural channels is probably the reaction of the organism as a whole. Here the theory of Thorndike called **connectionism** holds widest influence. This theory is based on three laws: exercise, effect, and readiness, with five supplementary principles added:

1. The principle of multiple response or varied reaction.
2. The principle of attitude, disposition or mental sets.
3. The principle of partial activity.
4. The principle of assimilation or response by analogy.
5. Associative shifting or the conditioned response.

1. **The Law of Exercise: Use, Frequency, and Practice.** It is a common belief that repetition is important in learning. This law of exercise, or use, has been the basis for extensive drill practices used by young and old alike. But modifications of the condition of learning may change completely the amount of drill that seems to be necessary, and under certain conditions may remove entirely the necessity of drill. Exercise should be applied only when it appears to be useful for if it is done mechanically or meaninglessly, learning results may be negligible. The facts may be stated in the following law: *The continued use of a reaction which is accompanied by satisfaction increases the certainty of its recurrence and the ease and skill with which it is performed.* Conversely, the disuse of a reaction decreases the certainty of its recurrence and the ease and skill with which it is performed.

2. **The Law of Effect.** It is well known that satisfaction is an invaluable asset to learning. It strengthens the response, whereas irritable tasks and annoying circumstances weaken the response. The principles of this law may be gathered into the following statement: *When a reaction is accompanied or followed by feelings of agreeableness, pleasure, or satisfaction, the tendency exists for this reaction to be repeated and so build itself into behavior and habit.*

3. **The Law of Readiness.** The more completely an organism is ready to respond the more satisfying will be the response, and, conversely, when an organism is not ready the response will be less satisfying. Hence motivation to learning is evidenced in numerous ways, such as high grades for work well done, prizes and rewards for superior work, commendation for tasks achieved and successfully met. The law may be summed up in the following statement: *When an organism is ready for a particular activity, the performance of that activity is satisfying and the inhibition of it annoying.*

Thorndike's theory of learning describes mental operations in terms of "connections" within the nervous system. Learning is said to consist of fixing "bonds" between a stimulus and a response, bonds being the connection made combining the stimulus and the response and making a more or less regular and certain reaction to a given situation.

The Gestalt Theory of Learning. To show the breadth of learning theories we may cite the Gestalt position. Instead of describing learning as the establishment of multitudinous "connections" or "bonds" this theory explains learning in terms of whole responses or configurations. Learning is said to take place through insight, goals, and maturation. Insight is emphasized in place of practice. It is best understood by such common phrases as "I see," "now I've got it," hence where there is no insight there is no learning. Goals must be envisaged, and for them the learner must purposefully strive. He must have a purpose in his learning, hence learning is motivated by purpose, ends sought, and goals seen. But often a learner is without insight, and may have no goal, and a relatively small amount of practice is not sufficient to evoke insight. Then it can be assumed that the learner is not sufficiently mature psychologically for that particular learning and the needed degree of maturity must be built up.

Human learning is so complex that theories, however promising, fall down sooner or later. They shift in value with the passing of time, and all of them have merits and all are subject to criticism. The fact is that the normal individual does learn and capacity for learning counts. Hence the human being is said to have learned when he has been stimulated, instructed, to behave in a certain way,

making whatever changes are necessary in his organism. When this achievement has been maintained it is assumed that he will be able to act in like capacity without instruction or stimulation. It can then be said that he has learned. Education of any kind has been successful when an individual evidences this skill, and both biologic and psychological changes have been effected. This fact shows clearly the difference between man and the creatures of the lower animal world.

HOW DO WE LEARN?

It is a strange fact that the lower forms of life—earthworms, guinea pigs, rats, etc., show comparatively high development in learning when compared with the slow stumbling learning of infants. A young ape is ready to walk in a few days, but the human child does not walk for about a year. The longer infancy of humans, with corresponding helplessness, offers avenues for growth of mind far beyond the possibilities of the infrahuman. With the advance of years man has more problems to solve than the animal, and can meet them better because of his higher control of impulses. His motor equipment for manipulating smaller movements of skill make finer adjustments possible and thereby give evidence of better cerebral organization. In meeting problem situations, man's facility for language, both spoken and written, offer what may be called the key to his development in all the stages of his mental and social progress.

In man, mental powers reach their zenith. Human responses have scaled the gamut from the lower reactions and proceeded to the higher forms of behavior. All the fundamental forms of behaving, such as reflex acts, instinctive procedures, and habit formations have been enriched by human experience and adjustments unknown in the lower animal world. Man's environment has been purposively extended and transferred to meet his desires and needs. Means of communication have been organized into speech, both verbal and symbolic, and learning is continuous and effective. Skills have been developed and made more voluntary, and learning has taken on the higher stages of creativity by exercise through the powers of imagination and reason. Learning in the lower forms of life begins with the organic adjustment of the animal to the demands placed upon

it by the environment. In man, learning culminates with the organism being able to adjust itself to its own demands. So the progression passes in an evolutionary manner from matter dominating nature to the human stage where nature, in the form of mind, dominates matter. How then do we learn?

We Learn by the Conditioning of Reflex Behavior. In point of organic activity the conditioning of reflex behavior is the primary form of human learning. This type takes its classic form from the work of the Russian physiologist Pavlov, who discovered that if a bell was rung when his dogs in the laboratory were fed, saliva, ordinarily flowing from the mouth of the animal in the feeding process, could be induced by the ringing of the bell alone.¹ From this intriguing experimentation there has grown the conditioned response theory of learning. Every act of our daily life is believed by the reflexologists to involve conditioned responses. Learning, therefore, consists in the formation of conditioned responses by physiological association, that is, by associating a response with a previously adequate biologic stimulus capable of producing the same physiological response. Hence it is asserted that education should be systematic in its attempt to develop conditioned responses that meet the normal requirements of human activity.

This theory of the conditioned response fits into the connectionism we have mentioned on a previous page. It shows that the human organism, in common with other organisms, has an original fund of responses which are primarily unlearned, instinct-like tendencies set in motion by the appropriate stimuli which is "biologically adequate" to include a new and second stimulus that will produce the effects of older activity. When the second stimulus is associated with the first stimulus, and repeated a number of times, the natural response has been transferred to an artificial response and the individual is said to have been conditioned.

Conditioned responses account for many human likes and dislikes. Indeed most of the satisfactions and dissatisfactions of people are learned responses due to conditioning. But this kind of behavior may be temporary. Unless the conditioning has become a habit the conditioned response may be amenable to the law of disuse. Antag-

¹ See Ivan Pavlov, *The Conditioned Reflex*.

onistic stimuli weaken them, and age, in the main, forbids their rapid development. To make the conditioned response effective it must be reenforced, but repetition is not always needed to bring about a conditioning because a single intense experience may suffice to create the learning.

We Learn by Trial and Error. It is a common practice for the lower animals to learn by trial and error in the manipulation of their difficulties. The building performances of apes illustrates this learning activity in abundance. With man, learning by trial and error is better stated as trial and success, because it is learning accomplished by selecting the successful response. For children, in their early years, nearly all intentional learning follows this trial and success method, and man in his mature years resorts to this method frequently. In all tasks that are not well understood and where difficulties gather, it is common to seek success blindly and conjecturally. Children's efforts are necessarily vague because their activities are usually more or less disorganized through lack of experience, and they "try, and try again" until learning becomes refined and organized into the more advanced forms of response. But this behavior should not be identified with random movements of the animal variety in which correct responses are made by chance alone. It is a try, try again method in which the effort slowly develops purpose, for whether successful or not this persistence is gaining in experience through more or less planned procedure.

We Learn by Observing, by Perceiving. Observation is the awareness of particulars and facts. It promotes attention, discrimination, recognition, and from these activities perceptions are built because the sensory impulses are now interpreted and made meaningful.

To observe is to attend to something that has yielded to the sensory processes, hence the fact of observing becomes the active principle of perception since it detects sense objects in their detail and in their entirety by close examination of the data of the senses. By it sensory experience is analyzed and organized.

Observe the following picture of an automobile accident. Look at the picture for a minute, then without the drawing before you, answer the questions that follow.

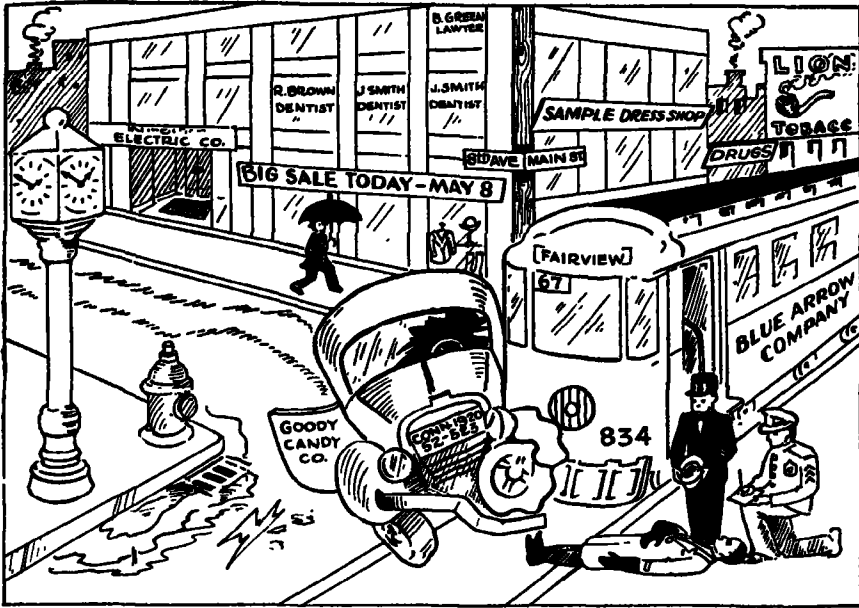


FIG. 47. A test of your powers of observation.

1. Describe the accident.
2. What was the date and time of the accident? (You will have observed the clock and the announcement concerning the "sale.")
3. Who was hurt?
4. Who owned the automobile?
5. What was the name of the streetcar line?
6. Where was the streetcar going?
7. What was the number of the streetcar?
8. Where did the accident occur?
9. What was the condition of the weather? (Note man with umbrella and the date of sale.)
10. What was the automobile number, date, and state registration?

You will probably not answer all of these questions on first observation. Try the test on different people and compare their answers for correct observation.

We Learn by Doing What We Perceive. Perceptual learning is never accomplished completely by the observational processes alone.

Actual attempts to perform must be made. In this manner approved responses are selected and undesirable movements avoided by attentive practice. Thereafter correct responses can be produced with a minimum of errors. This kind of learning is known as **perceptual-motor**. It supplements pure observational learning by coordinating muscular responses with perceptual or interpretative sense activity. We have all been trained in this perceptual-motor method—in the elementary school, in the home, and in the higher pursuits of learning. Our early attempts to pronounce words, to write, to perform the manual acts of common skills, typewriting, learning to play a musical instrument, the manipulation of higher professional and technical skills are all products of perceptual-motor learning. In all such situations muscular responses must be coordinated and adjusted to the mental patterns of perceptual experience.

There are three general classes of perceptual-motor learning: (1) learning new movements; (2) reenforcing and perfecting old movements with new perceptual experiences; and (3) perfecting responses with accuracy, precision, and skill so that the specific learning becomes habitual.

(1) **LEARNING NEW MOVEMENTS.** This kind of learning is associated with our childhood. We speak of it often as habits gained by routine and playful activities, but actually it is the beginning of growing human skills and represents the perceptual basis for all later mental growth.

(2) **REENFORCING OLD MOVEMENTS.** By this method perceptual-motor learning adds to the existing habits of childhood. At this stage of life the child can walk, run, play and perform the ordinary skills of childhood. Now he begins, or is taught, to ride a bicycle, swim, accomplish higher manual skills such as simple carpentry, build uncomplicated machinery with erector sets, and later . . . radios.

(3) **ACCURACY, PRECISION.** With the advance of perceptual-motor learning activities we gain speed in production. Precision and accuracy of skill develop because earlier perceptual-motor patterns are perfected through reorganization and recoordination of movements, and better control of existing situations is effected. The skills of manipulation seen in rapidity of action—in sports, in doing many manual acts, show the advantages of high coordination of

muscular behavior. Here the perfecting of certain skills is strongly in evidence, and success and achievement in such activities are displayed.

Perceptual-motor learning stresses performance, achievement, and accomplishment. Generally it is most profitable to the learner when attention is given to movements as a whole, when objective results of the movements of the body are noted, rather than by giving thought to detailed and isolated acts. By this means a task is pursued in its entirety, and learning is sought for the complex activity. Only when certain phases cannot be mastered should they be dealt with as single tasks in this kind of learning. The method has been well demonstrated in learning to typewrite, to play a piano, to skate, to perfect a play in football. Therein the complexity of "insightful" interpretation (perception) and actually doing the essential movements (motor) are duly combined, and should meet with success.

We Learn By Remembering. This kind of learning is frequently called associational learning because it is concerned with verbal acts rather than acts of motor skill. It seeks to implant words and ideas in the mind, hence the most conspicuous process of associated learning is memorizing, which is in common acceptance. It identifies the holding on to what has been learned. Through retention or "the carry-over effect" of previous adjustments the ability to recall testifies to the fact of remembering. Memorizing is a process of fixing associations. By this method we learn to spell words, we acquire factual information, learn names, faces, dates. Four important processes in memorizing should be known by everyone: **FIRST, THERE IS THE ACT OF FORMING AN IMPRESSION.** Impulses proceeding from the sense organs pass to their terminals in the nervous system and brain where impressions are formed in a sort of registering act. **SECOND, CONNECTIONS OR ASSOCIATIONS ARE FORMED.** Present impulses and past registrations are related, perceptual meanings are expanded. **THIRD, THESE ASSOCIATIONS OR IMPRESSIONS ARE HELD** within the nervous system and brain as acts of learning. **FOURTH, THEY MAY BE RECALLED,** evidencing learning by memorizing.

To make memories effective associations should be meaningful. When meanings are attached to items to be learned the learner takes advantage of the associations that have been formed and the result

is more effective. Practice in this procedure will develop both quality and quantity of recall content. It is obviously not the number of repetitions that is most important, nor the speed of the activity, but the well-rounded meanings that emerge within the mental processes that contribute to the successful attainment of learning by remembering.

We Learn by Solving Problems. This type of learning involves the manipulation of abstract concepts and is really learning to think. No natural processes are higher in human life than the ability to think. Observational learning and the establishment of perceptual experiences give the psychological basis for thinking, which is the expression of man's highest intelligibility.

THOUGHT

Learning to Think. The manipulation of abstract concepts and general meanings leads to the skill of thinking. Every field of knowledge has a long list of abstract terms, abstract relationships, and the demand is laid on individuals to learn them. This obligation is especially true for the individual's field of interest, for his profes-

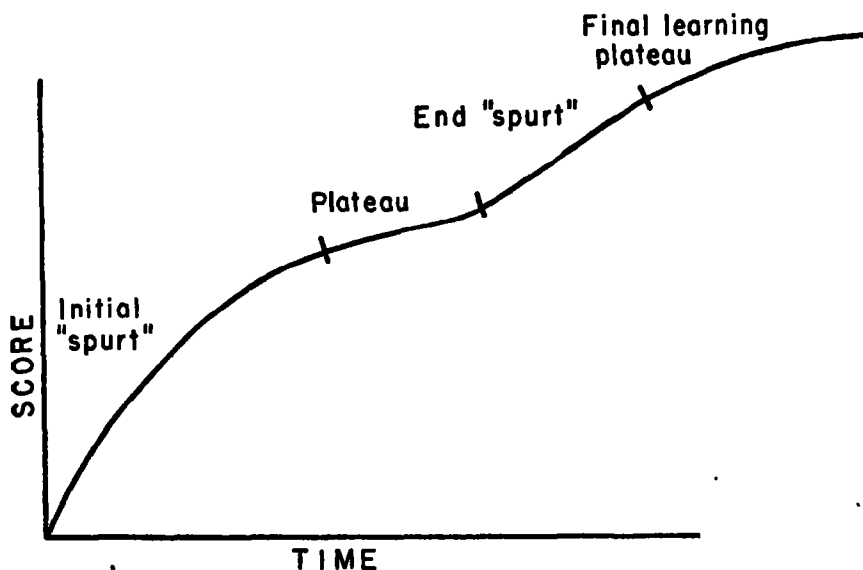


FIG. 48. The curve of learning.

sional adequacy, for his specialized knowledge. For instance, the terms used in biology, psychology, sociology have distinct and necessary meanings which must be understood if knowledge is to advance effectively. This fact is true of every field of learning, hence vocabulary is important, definitions are significant and should be learned because they represent abstractions, concepts of various degrees of generality necessary to both understanding and thinking. Terms like bacteria, receptor, intelligence, space, crowd, and hosts of other terms represent ideas and facts circumscribed by a word that is useless unless its meaning is known. The same is true of definitions, laws, principles, rules, for they too represent meanings which are enclosed within their statement. Learning to think therefore begins by knowing the meaning of words and symbols used in common life, in a field of knowledge, a science, a profession. Learning is not a haphazard process but a mental organization that grows with practice and demands concise and unrelenting vigilance.

Learn Abstract Meanings. Failure to understand meanings of words, symbols, definitions, rules, propositions, laws, ignorance of terminology, inability to grasp abstract concepts prevents effective thinking. Concepts are of two kinds, namely, general and abstract. General concepts represent general ideas and are formed by abstracting from concrete situations elements which are essential or general. Abstract meanings are formed by generalizing the common elements in the class of concrete situations. The development of clear concepts is a slow process because we start from ignorance or vague understanding and advance to the point of full or adequate comprehension. This slowness occurs in ordinary life experiences as well as in formal education. In the latter, studies, experiments, and exercises are used to seek the development of concepts. It is for this reason that textbooks are read, assignments given, papers written, discussions made. By such experiences new concepts emerge and knowledge is formed.

When conceptual thinking has emerged adequately then definitions are made which function to express the essential elements necessary for the handling of the concept expressed in words, frequently known as a **term**. Definitions, synopses, outlines, should follow a period of study because they seek to make the subject-matter pointed and concise. Seldom should definitions be learned at the beginning for at

that time their meaning, not being clear, may make the definition a mere verbalism which lacks understanding and thereby denude it of meaning. The folly of this futile method is well evidenced in the evils of cramming which attempts rote memory-learning devoid of adequate meaning. On the other hand when meanings are active the imagination is in function and creative thinking is stimulated.

Learn to Generalize by Facts. Facts supply the basis of generalization and make concepts clear. Facts and yet more facts are needed constantly in order to learn. Actually the discovery of facts is the foundation of all science and knowledge, but they must be balanced general concepts or general ideas which represent concrete situations.

Six Steps in Problem Solving. As a practical method of meeting problems and difficulties six essentials are frequently cited. These essentials of problem solving progress are not always carried on in the sequence in which they are stated for there are frequent interchange, borrowing and paying back in the thinking process. New possibilities occur as one proceeds, which in turn makes necessary the reformulation of the content of the thought stages.

1. *Define, describe, or delimit the problem.* This is the first rule of clear thinking. Problems arise from difficulties that have been noted, and difficulties are apparent because no solution has been found. Hence it is necessary to define the problem, to discover how it has arisen, and what we may have as mental investment to meet the requirements of the problem. When these essentials have been stated we are ready to proceed with the second step.

2. *Formulate hypotheses which might lead to a solution of the problem.* Hypotheses are not random wishing and guessing, they are theories of possible solution that are to be tried. Such theories are built on careful elaboration of the difficulty or problem. They demand a thinking plan and ability and determination to try it out by a sort of trial and error method. The better the plan, the better the chances of success.

3. *Gather necessary data supporting the hypotheses constructed for the solution of the problem.* Data may be gathered and selected from the standpoint of the sense perceptions, the situation in hand, past knowledge of experiences. The procedure is often time-consuming and expressed by the phrase "give me a little time," "let me think it over." Bias and prejudice should be strenuously avoided, and

only data that are pertinent and belonging to the realm of facts should be qualified and accredited. When such data do not lead to the support of the thought-plan or hypotheses they may be helpful in a negative way and refute the hypotheses demanding reformulation.

4. *Evaluate the data.* When sufficient data have been accumulated they should then be studied for significant relationships and comparisons in order to test the hypotheses. This testing occurs by various means such as arithmetical devices—figures “talk,” by statistical arrangement of the findings, by analyses, relationships, comparisons, and contrasts.

5. *Draw conclusions.* When evaluations have been properly made, conclusions should then be sought which will either refute or verify the findings. Conclusions do not come by merely collecting data, they are achieved by a mind that thinks through the problem with the data in hand. When this process has been duly completed a solution should be ready, and a conclusion consummated.

6. *Verification.* To be certain that the solution is the best that can be given for the problem it is usually necessary to verify the conclusion. Past data may be reworked, other data considered. When all these attempts result in the positive support of the conclusion, then the conclusion may be accepted as final. In the larger problems of science such procedure leads to the establishment of laws, the verification of theories. This is as far as the human mind can go. Thereby verification establishes a scientific approach to the solution of a problem which is probably the acme of human thinking.

Thus the thinker, by a sort of generalization, finds himself thinking through the problems of life, surmounting its many difficulties in society, in business, in government, in professional pursuits, in science, and kindred intellectual tasks. Individual acts and modes of behaving are thereby finely interrogated, inventoried, classified, and particular situations are seen in the light of progress.

Learning by Cultural Means. Besides the methods of learning and the types of activity involved there are certain aspects of learning that all people should subscribe to throughout life.

1. *We should learn to appreciate.* To become accomplished in skills is not enough; not even reflective thinking suffices to grant the average human being the pleasures he should experience. We should

learn to enjoy, to appreciate, to acquire tastes, and this is done by learning the values of music, fine arts, architecture, in their application to the life of man and society, and by developing standards of taste for finer ways of living. The processes involved are different from learning to play a musical instrument, learning to paint, learning to write, which are developments of acts of skill. In the exercise of developing the art of appreciation, the estate of feeling and emotion and attitudes surpasses the skills. An individual may not succeed in the skills of the fine arts but he can succeed in enjoying them.

2. *We should learn to develop judgment and imagination.* This learning is effected by our understanding and appreciation of social events, happenings in the modern world of war and peace, happenings in the past. These values are the subject-matter known in academic terms as social science and history. Throughout our lives we have sought cover for our knowledge of past and present events by the general use of concepts. We have formed our own views, stimulated of course by the conditionings of our environment. We have taken the word revolution and associated it with our historical interpretation, or current events.

Verbal imagery has been created by the school, by reading books and magazines, by lectures and pageantry, by the "moving pictures." Since the human organism has no sense organs for time, we are driven to interpret history through judgment and imagination. An event in the past is just a word expressing a fact, a verbal symbol, unless it is attached and associated with vivid imagery. When historical situations are so presented, pictured clearly, they constitute powerful factors in the development of attitudes and understanding of historical events. These attitudes may be warped by the insufficiencies of our experience and knowledge, our understanding may be inaccurate, and our judgment biased. Yet, it is better to give a strong opinion, even a biased opinion, than be drenched in docile ignorance, for the active mind is always subject to a change for the better.

With judgment striving to function accurately in evaluating past and present events, the historical monuments of yesterday and current circumstances of today should bring the best skills of learning into worthy action. When judgment is motivated by imagination, data derived from the past are reorganized and supplied with new

relations; there is then a chance for creative thought which brings pleasures hitherto undiscovered.

3. *We must learn to discover facts.* This learning usage proceeds from what might be called "the arithmetic sense," or the ability to count factually carried to the heights of mathematical ingenuity. From earliest grades in the public school we have been introduced to training that involves the mastery of an abstract system of thinking through arithmetic. The number symbols known to all literate people connect them with the objective realities of experience. Arithmetic emphasizes the objective aspect of experience, it matches numbers with realities, and experience is thought of in terms of quantities applied to objects. Training in algebra took us a stage farther than arithmetic. In arithmetic the symbols are fixed in terms of quantity, and this is the basic phase of factual thinking. In the case of algebra the symbols are variable in terms of objects represented and their quantities. Algebraic thinking supplies a set of general laws and relationships which may apply to any quantities and any materials. It shows the possibilities of recombinations in the abstract, and should be resorted to in order that meanings may be comprehended.

From the factual standpoint logical thinking is more important than arithmetic or algebra. Geometric aids are built on the criterion of internal consistency rather than on external measurements, which are prominent in arithmetic.

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ORIENTATION

DEFINITION : Thinking is the highest mental activity initiated by a problem that should be solved.

Biologic Foundations.

1. Intercerebral activity.
2. Peripheral activity.

Psychological factors in thinking.

Types of thinking.

1. Repetitive.
2. Partitive.
3. Combinative.

Major aspects of thinking.

1. Problem solving.
2. Relational thinking.
3. Indirect comparison.
4. Symbolic.
5. Creative.

Thinking through language.

Images, Ideas, and Imagination.

Images : the reproduction of previous perceptual response.

Ideas : a symbol which represents an object not immediately present to the senses.

Imagination : a reorganization of past experiences.

Concepts.

Function.

Generalization.

Abstraction.

Need for concepts in thinking.

Judgment.

Reasoning.

Gathering, combining, observing data.

Testing conclusions.

Task of education.



15

Thinking

Behind the overt responses of man's behavior which can be directly observed there lies an inner world of thoughts, some of which are communicated to others by means of words and gestures, and some of which evade our efforts to speak or write. Thought continues in normal man with or without language when reflection is active, and the problem of the psychologist is to relate this inner stream of activity wherever possible.

THE PROBLEM OF THINKING

Definition. Thinking is the highest psychological function of man's organism. It includes all the phenomena of perception, memory, imagination, and is colored by strong emotional reactions. By its very nature it transcends the individual. It arises within a context which provides initial meanings, and always relates to the environment for we normally think about objects, not ourselves. Thus, *when a person is thinking he is pursuing a course of mental activity, initiated by an immediate problem or task, and in search of a solution.*

Biologic Foundations. Thinking, like other psychological functions, is built from lower behavior-activities, and becomes a highly specialized factor in man's existence. It is basically an act of a living organism with anatomic and physiologic bases.

Anatomically the foundation of thinking is the cerebral cortex. Neural impulses shift among association and commissural fibers connecting various parts of the cortical area. This recognition leads to the assumption that the highest mental processes take place in the association areas of the brain, those areas made up of association and commissural fibers which are by far the largest neural part of the cerebrum. This view is supported by the fact that in case of

serious injury to certain parts of the cortex, one may lose the ability to interpret and understand sense data.

The physiological function in thinking is the same as any reaction involving the basic activity of the nervous system, with its sequence of neurons. Dashiell¹ offers two views involving the physiological functions in thinking, two functions which through their cooperation develop neural arcs within the cerebral process. These are (1) **inter-cerebral activity** which recognizes neural functioning within the associative areas of the cerebrum, and (2) **peripheral activity** which gives foundation to thinking by associative pathways forming connectors between the peripheral tracts in the sensory motor circuits.

The psychological implications of this biologic processing are the general and popularly accepted position and views that we think with our brain. But a description of thinking which stops at the confines of the biologic organism is incomplete. Just as a living organism is inconceivable without a life-supporting environment, so thought, in common with the rest of behavior, requires more than mechanism to maintain the process of thinking. To provide a full and complete inclusion of facts indicating the involvements is difficult if not impossible. All we can know is covered by a survey of possibilities.

PSYCHOLOGICAL FACTORS IN THINKING

Types of Thinking. Dunlap² has indicated three types of thinking, classified according to their content. These types are repetitive thinking, partitive, thinking, and combinative thinking. Repetitive thinking involves the repetition of a previous experience which has been thought about subsisting as a sort of memory activity. Partitive thinking brings a part of a previous thought-activity into function. Not the whole of the previous experience but only a part of the earlier thought-content is active. Combinative thinking carries with it two or more parts of perceptual content. These parts inhere, hold together, producing something more than single thought action. They show progress and become creative because they are constructive.

¹ J. F. Dashiell, *The Fundamentals of Objective Psychology*, pp. 566-568.

² Knight Dunlap, *Elements of Psychology*, pp. 279 ff.

Major Aspects of Thinking. Thinking is usually described in its forms rather than in its bases and causes. It is too comprehensive to be confined within prescribed limits because it is actually the highest function of human nature, the altitude of the psychological process, and the highest activity of man. In this regard thinking can best be described psychologically as **problem solving**. We have included problem solving as the highest stage in human learning (See page 202 f.). Some problems in life are relatively simple and may be met explicitly with more or less trial and error procedure, but there are other problems that are more difficult and must be solved by the skills of reasoning. Actually it is in the difficult problems and the manner in which they are solved that we attain the dignity of thinking. They are the problems that baffle us, that call for multiple mental energy, for highest mental organization, that must be solved by the highest means we possess which are involved in the process of thinking.

Building up from problems we arrive at **relational thinking** whereby problems are solved by relationships. In this form thinking becomes a form of logic, as in the syllogism where a conclusion drawn from premises relates the statements. An illustration of the syllogism of logic is the familiar:

All men are mortal, (major premise)
John Brown is a man, (minor premise)
Therefore, John Brown is mortal. (conclusion)

But the syllogism may be misleading to the individual thinker because of language difficulties, or because of unfamiliarity with the topic under discussion, and thought may venture into more complicated realms, such as **indirect comparison**. Here the procedure of thinking uses numbers or quantitative measures, and compares them with the known so that we may better understand the unknown, and imply the difference. Such relations are extremely usable mental tools in thinking on certain problems.

In much of our thinking only a slight portion of the perceptual content of an event or object is present. The sense data are insufficient to provide an adequate solution and must be supplemented by additional symbols commonly provided by words and numbers. The employment of word and number symbols makes it easy to think

about things without having to manipulate concrete objects. This is **symbolic thinking**, so highly efficient in human civilization, and so important in writing and reckoning.

The highest aspect of thinking is often said to be **creative** or **inventive thinking**, which provides new skills, new inventions, and new views of life. That it is a new kind of thinking is often questioned and the contention is made that it is really a recombination of old perceptions. There is considerable evidence that creative thinking is merely combinative. If every thought relies on previous perceptual experience this contention is true, unless in the combination new dimensions of thought-products arise.

Thinking Through Language. The greatest of the overt reactions involved in man's thinking is language. It is characteristic of our life in two forms, spoken language and written symbols. The two are in many ways the same. Through language human civilization has progressed to a high level, and the means for the communication of ideas has been important in this growth. Through language reactions we account overtly for our abstractions, generalizations, and reasonings. Speech and thought are intimately related but they are not identical. Speech facilitates and aids the growth of thought.

Language and thought are closely allied in many ways. Five factors may be enumerated as proof. (1) Language is a great aid to thought: speaking promotes thinking. (2) Spoken and written language exhibits characteristics of directed thought showing relationship and control. (3) Language is a substitute for facts and events. Usually it can be manipulated more easily than the facts themselves. (4) Words are economical when used thoughtfully, and save thought as well as aid it. (5) When language is confused, unclear, ambiguous, it prevents accurate thought. Language is a thought-mechanism. Some psychologists view all thought as merely speech, the manipulation of words in muscular behavior. Watson^a goes so far as to say that all thinking is subvocal speech. But this assertion is belied by the fact that thinking usually proceeds faster than the vocal organs can speak, and public speaking demands that thinking shall precede the spoken word.

Psychology is interested in the diction side of language. The manner of speaking and the choice of words tend to indicate clear

^a J. B. Watson, *Behaviorism*, Chapter 10.

thinking, while the opposite of this—slovenly speech—indicates slovenly habits of thought.

IMAGES, IDEAS, AND IMAGINATION

Attempts to explain the dependence of thinking on a repetition of brain processes alone has been largely abandoned because of the uncertainty, if not the absence, of the afferent pattern of previous perceptual responses. Here the problem of what happens in the thinking-response is acute. It invites many theories from psychologists and philosophers. The psychologist delves into all the possibilities of the rearrangement of cerebral responses; the philosopher clings to the arrangement of ideas. Both points of view are useful because experience provides for the existence of mental products which in their highest categories evade mechanical explanation. What are images and ideas, and wherein do they support imagination and thought?

Images. Some psychologists insist that thought consists of a succession of images, and some maintain that images are unnecessary. Imaging is thinking of an object when sense data and intrinsic relations are involved. It is an experience which reproduces a previous perceptual response in the absence of the original sensory stimulation.⁴ C. Spearman⁵ insists that images are not indispensable and not of any assistance to thinking. From his investigations he is convinced there is no correlation between the two. Introspectionists would deny this and contend that mental life is rich in imagery. The truth of the matter may be that some thinking is rich in imagery, and some is not, due, in all probability, to differing individuals and differing events and circumstances.

Ideas. Like images, ideas are experiences not directly due to sensory stimulation. Dunlap⁶ regards an idea as symbolic of "an object thought of as related to other objects," an idea of an object which constitutes the concept of the object. Thus, objects slowly become more and more distinguishable as concepts develop from ideas. This mental evolution will be more clearly appreciated in the

⁴ See Knight Dunlap, *op. cit.*, pp. 281 ff.

⁵ C. Spearman, *The Nature of Intelligence and the Principles of Cognition*, p. 192.

⁶ Knight Dunlap, *op. cit.*, p. 281 ff.

subsequent discussion of concepts; meantime we shall regard the idea as a thought symbol in the thinking process.

Imagination. Imagination is creative. It takes past experiences and reorganizes its data so that new relations are produced. If images and ideas exist like pictures in the "mind" then imagination reproduces and extends experiences. To this end it is a mental process as rigidly determined as thinking to which it inheres, particularly in the creative function for normal behavior.

CONCEPTS

Concepts are supported by images and ideas. They are mental states or processes that represent general or abstract ideas rather than particulars. The concept of an object is what the object comes to mean to the individual who is thinking.

The Function of Concepts. The concept has to work to be a tool of successful thinking. It cannot be an idle by-stander, as we have intimated in a previous chapter (page 202). It has to work in the specification of classes of objects, naming their general groups. This industry is demanded for the physical environment insists on the objectivity of objects, and the social environment insists on their conformity with the accepted ideas for which the idea stands.

Generalization and Abstraction. One feature of human thinking which has long been puzzling is the fact that thought processes initiated in a concrete situation may have reference to many situations other than the original one. It is therefore often necessary to generalize, to respond specifically to a feature or set of features found in a number of different situations. So, when we learn to distinguish, as in childhood, horses from other animals, the same verbal response is made to all horses, regardless of their differences. The same activity of generalization is multiplied over and over again in all adult human experience—with men of different races, in social situations, and in daily events with their discriminations and search for validity. By it we seek to form a general idea, to make judgments on what we regard as an entire and complete class of data on the basis of our varied instances in human experience.

In abstraction we disregard irrelevant details, we observe characteristics independent of wholes. It is essential that we should for

the intelligent person is able to manifest an ability to think abstractly. This is the contention of all students who hallow the concept of intelligence. L. M. Terman has somewhere said that "an individual is intelligent in proportion as he is able to carry on abstract thinking." Abstract thinking is analytical, decisive, it picks up detail, makes for alertness, and sound judgment. Both abstraction and generalization may be carried into innumerable forms of purely symbolic thinking.

The Need for Concepts in Thinking. Without concepts thinking would be in a hopeless confusion. The adequacy of concepts places the gilded crown on perception and makes for adequacy of understanding. In turn this adequacy contributes highly to successful action and the application of means to ends. What human experience would be like without concepts is beyond our comprehension. Nothing would be clear, nothing would be definite, consistent thought would be impossible.

JUDGMENT

Judgment enters more or less into all our thinking. It is a mental act of relating two concepts, the affirmation of identity between two items of experience. So, in comparing plants in my garden, some of which I know by names and others being unknown by name to me, I compare the known with the unknown and ask: Is this unknown variety a weed or a foxglove? I know that both are flowers of a kind and try to judge between the foxglove I know and the similar growth that I seek to name. The affirmation or judgment is involved in "foxglove" and this "other plant." Percepts are involved, concepts are present, and judgment must be made for these mental factors are contemporaneous in experience. The perception gives the individual objects their sense interpretation, the concept gives the general idea or meaning of the objects as a related class, the judgment analyzes the meaning by relating the object to the concept to which it belongs, and thinking is thereby ably furnished with effective processes. Every time we come in contact with a new object, phases of this process, in whole or part, function. We are required to assign objects in our classification, and to do so requires judgment.

Judgment is a highly complex and highly coordinated mental process. It takes our concepts and affirms relations between them,

and leads on to what we call "truth." It gives us new knowledge, new meanings, wider understandings. It gives us what are known as universals or general truths which is an economy in thinking since by it we do not have to analyze each man to see if he fits into required relation with himself and objects. For example, suppose we have the concept "rose" and the concept "flower," and we think of these two concepts in their relation to each other. The mental factors involved are analyzed, compared, identities are sought to warrant the judgment "a rose is a flower" (not a vegetable, a tree, an animal).

What Makes Judgments Valid? The affirmation of relation existing between two objects which is basic to judgment calls for the dependability of our knowledge of the objects compared. If our knowledge is limited, scanty, then our judgment is insecure, subject to severe error, and undependable. It is a fault of our human kind that judgments are often made on the basis of limited knowledge which disqualifies our ability to make adequate comparisons. The remedy for this is to know more, to have more percepts, to discover more elements, to reexamine our concepts. Concepts differ in different individuals, as in every physical and mental trait possessed by man, as is witnessed in every controversy—in politics, morals, and science. We may call the concepts by the same name but that in itself settles nothing. But this difference does not mean that we should seek positive identities in our concepts, if it did judgments would be mechanical and this is precisely what they are not. Variety of view is the common bond of democratic society, and may be said to be another mother of invention which is largely individual.

REASONING

On the basis of the preceding discussion reasoning should be the means of solving problems by the use of concepts or general principles. Obviously it is a form of problem solving, but many problems are solved by effective recall, by the memory-function, and reasoning is not used. Reasoning occurs when the channels of our thought-processes are blocked, when facts must be restated, revised, reviewed. It is not a special psychological power but the highest utility of coordinated mental activities. It is the highest function of human

thinking, the altitude of the higher mental powers of man, depending on the complex organization of the brain and all its mental products.

Woodworth⁷ tells us that the crucial step in reasoning is drawing the conclusion to a given problem. To draw a conclusion is to see the implications of a combination of facts which require a "whole" process of observation and examination. He enumerates several steps in this process as follows :

1. **Gathering Data.** Pertinent data involved in any problem must be found and accurately observed, so that all data are clear.

2. **Combining Data.** When data have been gathered they must be assembled, brought into a compact and organized whole. This procedure implies careful selection whereby irrelevant material is discarded and appropriate material consolidated. By such means thinking is in progression and working toward the establishment of a conclusion.

3. **Observing the Implications of Combined Data.** If right data have been brought together the answer to the reasoner's question is there but it must be discovered by high mental means. Sometimes the conclusion may be gathered from the combination, but usually it is necessary to develop unifying ideas. The conclusion most probably comes at this point of mental activity.

4. **Testing the Conclusion.** Two methods are subscribed for seeking validity in reaching a reasoned conclusion, namely: (1) seeing the implications of the data from a fresh angle, and (2) subjecting the conclusion to the test of empirical fact.

When these factors have worked to establish a conclusion then it may be said that reason has done its work. There is nothing more that the human mind can do. But reason is not fool-proof even by the operation of the best methods by the best minds. Fallacies may occur, errors in reasoning which make the conclusion seem valid when it is not. Fallacies appear more in the initial stages of the reasoning process than in the logical deductions that are made, but they always invalidate the conclusion. From the standpoint of psychology such fallacies may be overcome by training to think.

The Task of Education. The highest stage of education is largely a training in the development of the thought-processes. If primary education teaches the child to perceive, and secondary education

⁷ R. S. Woodworth, *Psychology*, 1940, Fourth Edit., pp. 530-535.

teaches the youth to remember, college education should teach the student to think. Too much emphasis is often laid on imparting mere facts, and on retaining them. It is far more useful to know how to think about facts and to understand the principles that compel our highest devotion to thought. The training of the thought-processes means essentially the cultivation of reasoning ability, to image relationships, to apply what has been discovered, and to act accordingly. This ability is psychology at work in its highest human demand.

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ORIENTATION

Types of Psychology:

Structural, introspective, existential psychology.

Content psychology—describing the composition of the various mental states and conscious experiences.

Functional psychology.

A psychology of activities and processes rather than experiences, activities being determined by biologic factors whereby the organism is adjusted to its environment.

Behavioristic psychology.

Behaviorism emphasizing the activity of the organism without regard for consciousness and allied “mental states.”

Gestalt psychology.

Configurationism or form psychology, emphasizing the undivided wholeness, or unity of sense experiences.

Dynamic psychologies.

Warren.

Woodworth.

McDougall.

Declaring mental phenomena and experience as a cause and effect relationship through drives and motives determined by dynamic conditions.



16

Points of View in Psychology

The methods used in the experimental investigations of psychological facts vary. The different ways in which these facts are organized and interpreted give rise to various points of view, sometimes called psychological systems, such as functionalism, introspectionism, behaviorism, or better functional psychology, introspective psychology, gestalt psychology, etc. "Isms" are always irritating, and may be confusing, yet they are normal expressions of growth, scientific versatilities that proceed from the expansion of the inquiring mind. They are schools of thought that arise inevitably in a growing science. When these points of view are understood the magnitude of vital theory is sensed and less confusion occurs in reading psychological literature. The major emphases in psychological points of view are stated briefly in the following pages.

STRUCTURAL (INTROSPECTIVE, EXISTENTIAL PSYCHOLOGY)

This point of view is the oldest of the psychological systems. It is associated with the founder of modern scientific psychology, Wilhelm Wundt, who organized the first psychological laboratory in Leipzig, Germany, about the year 1875, and in many ways followed the philosophical tradition.

Structural psychology uses the introspective and subjective methods with attempted empirical precision. It has made large use of the mental elements—sensation, perception, and affection. It seeks to reduce all mental states to their simplest "elements" or mental parts, and combines them by means of an association process. The classic American representative of structural or introspective psychology was the late E. B. Titchener, at Cornell University.

Titchener was an avowed Wundtian, trained in Leipzig, as were many early American psychologists.

Consciousness. Structuralism emphasizes the introspective analysis of consciousness. It contends that psychology is the science of mental states or elements, consciousness being the sum total of mental elements or contents at any given moment.

Introspectionists analyze a state of consciousness into three groups of mental elements, namely, sensations, images, and feelings, which, when combined, form the more complex content of human experience. Sensations, built out of the attributes of quality, intensity-extensity, clearness, and duration, are the elements of perception. Images are the elements expressed as ideas, memories, and imagination. Feelings are the elements of emotion, constituted by the attributes of quality, intensity, and duration.

FUNCTIONAL PSYCHOLOGY

The functional point of view in psychology stresses the activity of the human organism and is largely objective and quantitative in method. Functionalism was influenced by America's pioneer psychologist William James, who urged the study of processes and the adaptation of the individual to his environment. This psychological system became the basis of modern pragmatic philosophy.

The historical meaning of functional psychology is associated with John Dewey, James Rowland Angell, and their followers. In 1896 Dewey wrote an article entitled: "The Reflex Arc Concept in Psychology."¹ In this article, which has become historically important, Dewey insisted that in human reaction the entire reflex arc is dominant. That is to say the entire circuit within the nervous system consisting of sense organs, conduction of impulses in the sensory paths, cord, discharged synaptically to the motor fibers leading to muscles and glands, is responsible for psychological response. Dewey objected to the analysis of the reflex arc into component elements and asserted that adjustment in human response occurs through organic units in function. He argued that new mental functions were presented when the unified organization of stimuli, sense activity, and reflex arcs operated, which have a common reference to a biologic

¹ *Psychological Review*, III, 1896, pp. 357-370.

end. Hence, it is only through the function of adaptation to the environment that these sense-factors acquire psychological significance.

A functional psychology might incline toward introspection and produce data on sensation, perception, attention, or it might regard these factors as sense and motor activities. In either case mental life consists of constantly changing processes which adjust the entire psychophysical organism to the conditions of a changing environment. Each process in this psychological activity is described as a unity, in its wholeness. Conscious forms arise from these general processes of adjustment, and psychology is declared to be the *science of activities or functions determined by the organism as it adjusts itself to the varying conditions of the environment*.

Functional Psychology and Psychometric Testing. Functional psychology has been instrumental in inventing and developing an objective point of view in psychological methodology. This objectivity is expressed in mental and educational tests where the adjustment factor is overwhelmingly apparent. Moreover, it has occasioned the reversion of education, character development, and moral approval to the more strictly biologic aspects of human nature. Because of this approach functional psychology gives tremendous consideration to the physiological relations in psychology emphasizing the sense-functions within the psychological process.

BEHAVIORISTIC PSYCHOLOGY

Behaviorism relates psychology closely with physiology and explains human mental life in terms of reflexes and allied physiological activities, mostly muscular contractions: thus, thought is declared to be a muscular contraction, an activity of the speech organs.

The Doctrine of Behaviorism. American behaviorism is the most radical of all psychological concepts. It has its base in J. B. Watson's polemic: "Psychology as the Behaviorist Views It."² Its systematic organization is set forth in Watson's volumes: *Behavior: An Introduction to Comparative Psychology* (1914), *Psychology from the Standpoint of a Behaviorist* (1919), and *Behaviorism* (1930). The doctrine of behaviorism asserts the justifiability and usefulness of

² *Psychological Review*, XX, 1913.

the objective methods as used in animal and human psychology. It explains conduct in terms of physical action, conditioned response, organic and muscular behavior. Its experimental investigations, relying wholly on physiologic and organic processes, rejects as invalid all subjective inquiry. Consciousness, mental states, mind, will, imagery and like terms are declared to be unpsychological. Behaviorism relegates all matters of the subjective life to the response of gross muscular mechanisms with their symbolized manifestations as objectivities in overt response. Accordingly, it defines psychology as the **science of behavior**, built on systematic observation and physical experimentation, on generalizations and principles which constitute the laws of man's behavior. It emphasizes the stimulation or situation from which response ensues, and attempts to predict the response from the stimulus situation, the stimulus being the agency which arouses the response, and the response representing the muscular or glandular movement due to the prevailing stimulus.

Kinds of Response. Behaviorism generally recognizes four kinds of response, which, taken together, represent conduct as the coordination of life. These responses are, first, explicit hereditary reactions, such as walking, grasping; second, implicit hereditary reactions, such as glandular secretions which give a deterministic foundation to life; third, explicit habit responses, represented in the various movements in play and allied functions; and fourth, implicit habit responses, such as habits formed by the conditioned reflex which is a cardinal matter for all behavior in man and animals alike.

The Methods of Behaviorism. The methods used by the behaviorists are ordinarily three in number, any one or more of which may be practiced. (1) The general method of **observation** used with or without instrumental control. (2) **Conditioning** of responses, such as the determined reflexes in glandular secretion or motor response. (3) **Verbal report** which follows closely on observation.

GESTALT PSYCHOLOGY

This point of view has grown up rapidly in the last few years. It originated in Germany, as did introspective psychology, and its classic leaders are Wolfgang Kohler: *The Gestalt Psychology* (1930), and the late Kurt Koffka: *The Growth of the Mind* (1925). In its

early history Gestalt psychology was destructive to traditional psychological science. It negated the methods and hypotheses of the older views concerning sensation, association, attention, conditioned reflexes, trial and error. Its heritage is classic, having dipped deep into philosophical soil, passing through four stages of development, namely: (1) epistemological inquiry with Ehrenfels, (2) epistemological elaboration with Meinong, (3) spatial and temporal configuration with Wertheimer, and (4) the inauguration of its modern stage as cited above.

The Doctrine of Gestalt. The main argument of **Gestaltpsychologie** is that experiences must be viewed in their entirety, as wholes, since parts do not have the same properties. Thus the sensation of a sound cannot be studied as a sensation alone because it represents the experiences of someone possessed with perceptions, motor attitudes, affective experiences, and meanings. This synthesis of psychological factors is called a configuration or form-pattern, characteristic of a given experience, which is an aspect of unitary structure. Accordingly, the development of a perception, imagination, reason, represents a configuration or pattern of experience, an expansion of native patterns in the individual. Hence, the **Gestalt** exceeds the sum of its component parts because it possesses unique properties that each separate part does not have. Each configuration thereupon possesses four essential characteristics: (1) **Unity**, meaning that a configuration is inherent in the figure itself and cannot be created by any outside activity, such as psychological processes. (2) **Interrelation**, signifying that the elements of a Gestalt derive their quality from the whole in which they inhere. These elements are not independent entities with characteristics of their own because all the elements of a form influence each other mutually. (3) **Form properties** indicate that the total figure possesses properties as a whole which are lost when analyzed into isolated elements. (4) **Meaning** is offered as evidence that all configurations are meaningful entities since all parts are necessarily interrelated.

The Gestalt is not a fixed neural pattern, but a disposition, a system involving insight which provides for the apprehension of meaning without regard to previous experience. It is a mental poise issuing under a given set of conditions with ever-increasing variety and complexity. Gestaltists define psychology as the *science of the conscious*

and behavior configurations of immediate experience. They reject both introspectionism and behaviorism, and employ the approach of functional description.

DYNAMIC PSYCHOLOGIES

Attempts to combine the objective and subjective views in American psychology have appeared in the efforts of many leading American psychologists. Many of these efforts have sought to include both behavioristic and introspective methods into new systems, where either seemed practical. More often the reward for this venture has been the construction of modified versions that strove to psychologize generally, rather than follow the dogma of an "ism." The contributions of Woodworth and Warren are cases in point.

Warren in *Human Psychology* (1919)³ declared that "conscious and neural phenomena constitute one single series of events, and that their different appearance is merely due to different ways of observing them." Accordingly, Warren sought to reconcile behaviorism and consciousness, to correlate both phenomena—"the properties of nerve substance" with "conscious experiences." Together as biologic and psychological factors they form a "total description" of human experience.

Woodworth in *Psychology* (1921) and subsequent revisions,⁴ supports Warren's general position, appreciating the objective and subjective aspects in psychology founded on the stimulus-response formula. Actually the basic aim of the stimulus-response psychology is to discover and explain the events of human conduct accruing from physiological changes occurring within the nervous system of man. Functional responses arising from the impact of physical stimuli on the organism are here in operation.

In *Dynamic Psychology* (1918), and the several revisions of *Psychology*, Woodworth recognizes the existence of a mass of innate capacities or "patterns" not clearly defined by nature although they belong in the "cause and effect" series, and are called dynamics.

Woodworth makes a distinction between "mechanism" and "drives." Mechanism is regarded as the manner in which something

³ Elaborated into Warren and Carmichael, *Elements of Human Psychology*, Rev. Edit., 1930.

⁴ 1929, 1934, 1940.

is done; drive is the impulse which causes something to be done. He speaks of instinct, habit, emotion as motives, the motive being the antecedent of ordinary activity and representative of the dynamic factors in behavior. Hence, he tries to see behavior in larger perspective, in terms of a "series of smaller acts leading up to some end result" of organized purposeful activity "which immediately becomes 'your activity in progress' motivating all the detailed movements or preparatory reactions composing the total activity."⁵ Moreover, he relates motive and stimulus, declaring motives to be "activities that have got started but not yet finished." Accordingly, human conduct is part of a systematic interpretation of mental phenomena, a succession of cause and effect emphasizing drives and motives. It is this assortment of impulses, motives, urges, drives, with their contiguous functionings in higher behavior, that forms the groundwork of a dynamic interpretation of human conduct.

Purposive Psychology. The dynamic point of view is elaborated thoroughly by William McDougall.⁶ This system is called *hormic psychology* because it views organic phenomena as being determined by the purposive factors associated with native dispositions, urges, human tendencies regarded as purposive strivings.

Hormic psychology denies that behavior is completely explicable in purely material, mechanical, or psychochemical terms. It recognizes that man "inherits propensities (strong tendencies) natural to his species," which are fundamental to his strivings and purposes. These strivings are purposive because they always seek an end or goal in every human effort. Hormic psychology defines its subject matter as the *science of purposive behavior*.

PSYCHOLOGY A COORDINATE SCIENCE

The magnitude of the demands laid on the mental side of life, the alertness of experimental and allied investigations made by a young and growing science, and the progressive expansion of modern natural science inevitably stimulate variety of approach in psychological thought. Therefore, the beginner in psychology should not become disturbed over the questions involving the pros and cons of point of

⁵ R. S. Woodworth, *Psychology*, Rev. Edit., 1929, pp. 238, 245.

⁶ William McDougall, *An Outline of Psychology*, 1923; *Energies of Men*, 1932; *Psychologies of 1925*, edit. by C. Murchison, pp. 273-305.

view. Controversy always carries certain advantages in science because it signifies growth and the agitations of progress. Without this scientific fermentation, psychology like any other science would be static. Moreover when we view the social and technical tasks imposed on modern psychology, as indicated in our classification of psychology and its fields of expression, it will be clear that academic psychology is necessarily as wide as man's mind. Hence, no apology is needed for the variableness in points of view, and time is ill-spent in developing hostile criticism toward differing interpretations. It is better to coordinate these views as far as possible and psychologize progressively.

PSYCHOLOGY IN THE SYSTEM OF THE SCIENCES

1. Biology gives psychology its foundation, physiology its natural organic form.
2. Physics gives it method and provides a means of experimentation.
3. Psychology develops its own specific task in seeking to evaluate those manifestations, called human nature, which lie beyond its anatomical and physiological foundations, using physical means to ascertain its facts.
4. Psychological facts give the groundwork for man's relationship to the social order illustrated by the social sciences.

PSYCHOLOGICAL OBJECTIVISM

1. Behaviorism
2. Epiphenomenalism
3. Physiological psychology



Body (emerges as Mind)
 Body (separate entities)
 Body (interdependent relations)
 Body no mind

Body (insignificant) mind prepotent
 Body

PSYCHOLOGY AS MENTAL ACTIVITY

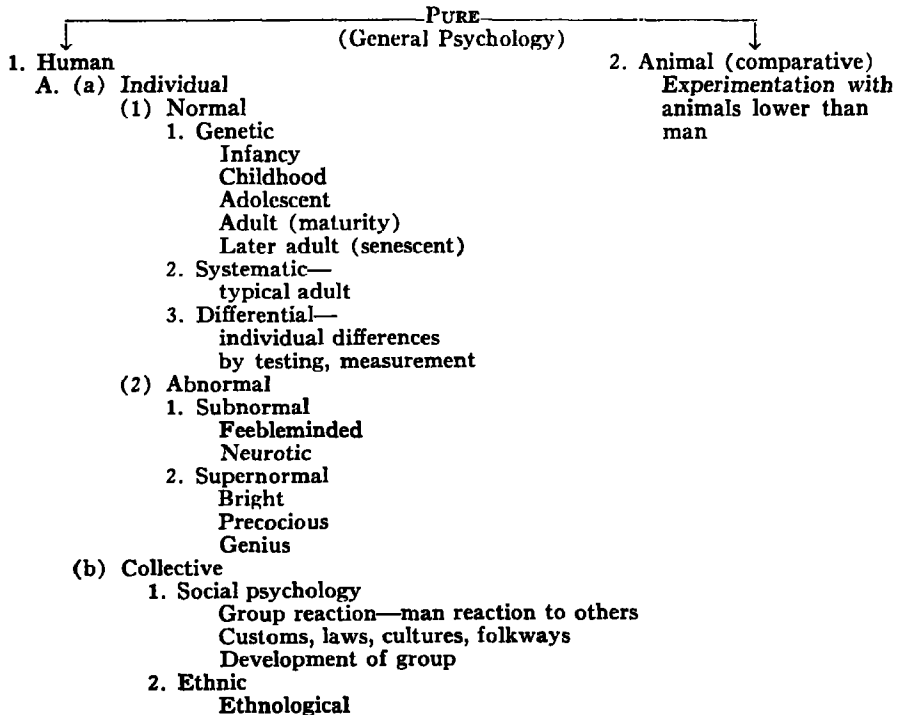
1. Structuralism—introspective psychology
2. Functionalism
3. Purposive (hormic) psychology
4. Reaction psychology
5. Dynamic psychology
6. Act psychology
7. Personal or self psychology



Mind (1. Emergent theory)
 Mind (2. Dualism)
 Mind (3. Interactionism)
 (4. Materialism
 Materialistic monism)
 Mind (5. Mental monism)
 Mind (6. Double aspect of one reality)

APPLIED (PSYCHOTECHNOLOGICAL)

1. Educational
 - Diagnostic
 - Prognostic
 - Guidance
 - Pedagogic—administrative
2. Medical
 - Psychopathologic
 - Psychotherapeutic
 - Psychiatric
3. Industrial (employment)
 1. Vocational—Selection, Guidance
 2. Personnel
 3. Economic—Salesmanship, advertising, management
4. Legal
 1. Reformative
 2. Detective
 3. Evidential
5. Recreational
 1. Directive
 2. Performative
 3. Observative





PART FOUR

Personality Adjustment

In the previous pages we have presented the important phases of objective psychology, otherwise known as atomic, nomothetic or general psychology. This psychology seeks to establish facts and principles which provide a basis for the general application of psychology. It is a psychology which respects the laws of natural science expressed in cause and effect relationships. It is commonly called General Psychology because it gives the general ground-plan of human life, the pattern of reaction and response, and the principles that determine and govern the psychological patterns of human living.

Since psychology is fundamentally concerned with individuals, its chief law being the fact of individual differences, it is necessary to take a wider view. This adventure is precisely the problem of personality which is important because it relates the biopsychological individual to his social responsibilities and obligations. In this recognition human life is not only a pressure from the deep biologic organism but it is also creative, dynamic, goal-seeking in its behavior. Normal life should always point to a goal because the normal man ever seeks the enlargement of himself. Man is basically biochemical but ultimately he is psychological and social. This latter emphasis is dynamic, idiographic and personal. Personality is always individual and psychologically unique. It is the dynamic point of view that offers the possibility of human integration whereby the individual becomes a unified, wholesome personality, yet differentiated from others and reasonably specialized unto himself.

Broadly speaking personality represents the style of the individual and his psychological uniqueness. It represents a combination of man's drives, his sense reactions, his perceptual responses, his think-

ing, and his goal-seeking. In a word, personality is a synthesis of the stimulations and purposeful behavior of the individual.

The design of the following chapters is to bare the problem of human personality, attempting to indicate what it is, how it may be viewed, how it may be measured, and its essential adjustment.

ORIENTATION

What Is Personality?

Three Levels of Personality.

1. The organic.
2. The functional.
3. The psychological.

The Stages of Human Growth: infancy, childhood, adolescence, adulthood, senescence.

The Basic Elements of Personality.

1. A healthy body.
2. Intelligence.
3. Motility.
4. Temperament.
5. Self-expression.
6. Sociability.

Intelligence and Its Variations in Human Life.

Maturation.

Integration.

17

Human Behavior and Personality

The previous chapters have presented the essence of general psychology, which gives foundation to human life. We have noted how the intelligible capacities based within the nervous system, effected by sensory-motor reactions, issue in the knowledge phases of human life through sensitivities, perceptual responses, remembering and recalling, and thinking. Now it is necessary to show how human behavior takes on its superb form which commonly goes by the name **personality**. Every man is fundamentally an individual, a person, and a person who is sick or well. The following pages will sketch some major aspects in the development and maintenance of the human personality.

WHAT IS PERSONALITY?

Popularly, personality stands for the manner in which an individual appears before his fellows, the front he makes as he lives in common everyday experience, his impressiveness of dressed-up physicalness. In psychological usage the human personality represents the total outcome of an individual's physical, mental, and social organization. It comprises a totality of his attitudes, feelings, and mental character, or the entire structure of an individual's habitual attitudes and behavior patterns. Personality is grounded in man's physical organism, for we possess by nature the physical structure out of which personality is made. These factors are the rudiments from which appear what we call our personal life. So the main task of every man and woman is to organize this basic human investment into effective personal living.

THE LEVELS OF PERSONALITY

Human personality is a combination of essential organic structures and a synthesis of various functions. By themselves these fundamental structures and their processes constitute a level or aspect of the total personality, each performing its part as required by nature and circumstance. Taken together, in combination, these structures and functions offer the bio-psychological approach to personality. The chief phases of this synthesis may be specified as the organic, the functional, and the psychological levels of personality.

The Organic Level. The organic or basic level of personality is concerned with the vital processes of life—respiration, circulation, digestion, muscular contraction, reproduction, and their contiguous organic processes which involve the life-activity of all the vital organs of the body—lungs, heart, stomach, etc. These processes coordinate to provide man with the essential machinery of human living, hence the various parts of the organism are mutually interdependent, providing essential organic adjustment.

The Functional Level. The characteristic structure of the organism is that it must function, behave, react, respond to stimuli. Through the previous chapters abundant representations of functional activities have been enumerated, and they all make what may be called a behavior approach to the human personality. This functional level takes hold of the stimulus-response mechanism, sensory-motor reactions, and the performances of the reflex arcs. It shows itself specifically in reflex behavior and in the conditioning of reflex acts. In fact, the conditioned response lies at the basis of all learning and of much of man's practical ways of reacting. His likes and dislikes, his positive and negative emotional responses, otherwise known as his social conditioning, take place at this functional level. The simple reflexes, such as coughing, sneezing, yawning, which always carry styles of reaction, represent the simplest activities of human personal life at the behavior level. The conditioned responses which have interwoven everyday habits in characteristic personality represent the highest form of reflexive behavior.

The Psychological Level. The highly specialized aggregation and systematization of the receptors or sense organs, discussed in

the previous chapters under the names of exteroception, proprioception, interoception, constitute the first floor of psychological personality. Stimulations not only start the organism functioning, but they set in motion the sensory mechanism and lead on to man's higher responses, commonly spoken of as intellectual or mental. These responses comprise perceptual abilities, which are sense interpretations giving the objects about us *their essential meaning*. Such perceptual performance provides for the abilities of memory—remembering and recalling; they lead to organized imagination, creative and inventive skills of the motor and intellectual varieties, and constitute the avenues that lead to thinking. Within this organization, which we have elsewhere called the receptor-effector system, lie those complex responses known as emotions and their associated drives. Thus, fear and anger which represent personality elements on the psychological level are determined by organic responses in the muscular, glandular, and probably vasomotor regions.

The personality determiner on this psychological level is man's possession of a highly organized brain. In the course of evolution man is the highest vertebrate, distinguished by superior cortical activity which coordinates his skills of body and mind. From such cerebral organization emerge language in its best productions of speech and thinking, and skills of hand and muscle. Man is thereby prepared for highest organic effectivity.

THE STAGES OF HUMAN GROWTH

Human life consists of stages of growth, and each stage is marked by an appropriate psychology. The first and second years of life cover the period of infancy which terminates with dentition, speech, locomotion, and simple manipulatory skills. Ten more years of this growth procedure are required to complete the chronologic stage of childhood, though some individuals never outgrow their childhood because their psychological development is impeded. Childhood terminates with the onset of puberty, which marks the beginning of manhood or womanhood. Then begins approximately a dozen years of adolescence which acts as the bridge between childhood and adulthood. Adolescence is characterized by physical and mental growth, with girls usually more accelerated than boys. It is a period

of crystallizing the earlier personality patterns, of social conditioning and social orientation. Adulthood appears when physical, mental, and emotional maturity begin to take form, and is maintained until middle life, followed by old age or senescence. Throughout these stages of human growth we possess by nature the factors of body and mind out of which personality can be made, and it is every individual's primary responsibility to develop therefrom an effective personal life.

The Basic Elements of Personality. At each stage of life's growth it is every man and woman's responsibility to develop himself coincident with his age—as a child, as an adolescent, as an adult. None the less a conclusive category of requirements is always incomplete because of the variability of individual life, yet there are some phases of human behavior that are indispensable; these are, as Floyd Allport has stated,¹ physical condition, intelligence, skills and styles, temperament, self-expression, sociability, drive and morality.

The compulsion is laid on us therefore (1) to develop a strong, healthy body and keep it well; to attain good health and maintain it. (2) The second demand is to learn, to show the effects of sound judgment in all our individual and social undertakings. This element of personality is known as intelligence which is its psychological foundation. (3) But besides normal intelligence it is necessary to perform essential skills without undue laziness and ineptitude, and this principle of personality is referred to as motility. Yet, although an individual may be physically well, possess normal intelligence, and show reliable skills, he must express himself in (4) balanced temperament. He must not have too frequent emotional upsets and unusually rapid alternation of moods; on the contrary he must show emotional balance indicated by breadth of feeling which breaks down unnecessary narrowness of moods and interests. He must show normal emotional strength when needed, such as being able to bear the pains of distress, and refrain from undue elation when he meets success. In a word, he must express his emotional life normally and adequately. Hence, (5) he must show normal self-expression in his drives which forge onward with a definite goal or purpose of mind. (6) Finally, the compulsion is laid on us to be sociable, to express the

¹ Floyd H. Allport, *Social Psychology*, p. 103.

art and skill of living with others, sharing the responsibilities of social life and citizenship, obeying its laws, respecting its rights and declaring its duties, regarding them as agents in the development of human freedom.

Intelligence. Intelligence is so important in the formation of the human personality that it merits separate treatment. A Chinese proverb aptly says: "Whom heaven has endowed as a fool at his birth it is a waste of instruction to teach." Intelligence is a native energy, an endowment that demonstrates mental capacity. It is the functional core of psychic life and expresses itself as ability to profit by experience. Its purpose is to make adequate adjustments to life's varied demands, to meet new situations in a profitable manner. It is characterized by an Intelligence Quotient or IQ, found by dividing the mental age by the chronological age of the individual. The symbolic formula is written thus:

$$IQ = \frac{MA}{CA} \times 100$$

To illustrate: if a 10-year-old child has a mental age of 10 he would merit an IQ of 1.00 or more simply 100 and be considered average or normal. But a child may do better mentally than his chronologic age is expected to show, as for instance a 10-year-old child with a mental age of 12 would rate 120 IQ, or above the average. Another child of 10 years might show a mental age of 7 years and his IQ would be 70 and he would be below the normal or average child and be considered mentally retarded.

Approximately 25 per cent of the general population have IQ's less than 92; those with IQ's of 70 or less are feeble-minded. Another 25 per cent of the gross population have IQ's greater than 110 and represent an accelerated mental class from whom should come the dependably successful individuals—the professional, executive, and related leadership classes. Between these extremes are reputedly the normal individuals who rank average in intelligence. However, it should be stated that all attempts to divide intelligence into normal, feeble-minded, and accelerated groups are obviously arbitrary, yet classifications have been drawn for the purpose of practicability, as the accompanying table shows:

DISTRIBUTION OF INTELLIGENCE QUOTIENTS IN A NORMAL POPULATION

<i>IQ</i>	<i>Classification</i>	<i>Percentage</i>
140 and above	Near genius or genius	1
130-139	Very superior	2.5
120-129	Superior	8
110-119	Above average	16
90-109	Normal or average	45
80-89	Backward	16
70-79	Dull	8
60-69	Moron	2.5
59 and below	Imbecile	1
	Idiot	

Adapted from Harry A. Greene, Albert N. Jorgensen, and I. Raymond Gerberich, *Measurement and Evaluation in the Secondary School*, Longmans, Green and Company, New York, 1943, p. 233.

A high IQ does not guarantee an effective personality but it does indicate possibilities. An individual with a low intelligence should not be expected to make an equal contribution to efficiency with those of high intelligence capacity. Effective personality emerges only as this native capital, this gift of heredity, is wisely invested under the influence of constructive social stimulation. The graph descriptive of the general distribution of intelligence follows:

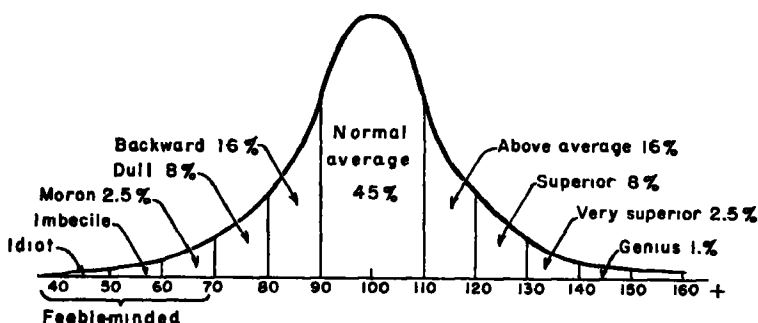


FIG. 49. Distribution of intelligence in the general population. (Intelligence Quotients on the Stanford-Binet scale. Note that the curve is the standard "bell-glass" shape.)

THREEFOLD INTELLIGENCE. Intelligence is interpreted as (a) abstract, (b) concrete or mechanical, and (c) social. Abstract intelligence is the ability to understand and manage ideas and symbols, such as words, numbers. Concrete or mechanical intelligence is the ability to learn, understand, and manage things, such as tools and concrete objects rather than the symbols of them. Social intelligence indicates the ability to understand and manage people, to act wisely in human relations. In every case intelligence in its broad meaning characterizes the individual as capable of adapting and maintaining himself in new situations and requirements of life. In a phrase intelligence means mental adaptability, thinking adjusted to new requirements.

MATURATION

Closely allied to intelligence is maturation, which is a ripening or maturing of a trait—a trait being a distinctive or distinguishing mode of behavior arising from the individual's endowment which is more or less permanent. Maturation therefore is conditioned by the internal forces of the organism and shows growth-changes in the structure and function of native character. Like intelligence, maturation is very important in the psychology of personality. •

The maturing or ripening of traits is a relatively slow yet progressive process. It is well-observed in the rapid growth of infants and continues on throughout normal life with its continuous learning, *being correlated with neural and glandular development.* But maturation invites more than bio-chemical processes involved in physical growth and development. Man must live with other human beings, hence complete maturation of the human personality cannot be secured outside the realm of society with its cultures and their values, in a world of facts, events, and circumstances. By this means the human personality is both bio-psychological and social. It carries all the energies of body—chemical, neural, physical, in a world of behavior, being interrelated with the forces of heredity and environment. •

Accordingly, maturation is dynamic and can shape the course of human events by taking care of life's stimulations, making them more properly the occasion for responses rather than the cause of

them. All students of public health and social welfare should take note of this possibility, otherwise the objective psychology we have defined becomes an out and out mechanical interpretation of man and his place in the world. Our obligation in the world about us is to be socialized, to be an integrated person, adjusted to the demands of life, facing its numerous tasks and challenges and succeeding in the effort:

INTEGRATION

With growth of body and mind every normal man and woman is endowed with facilities that make for living a normal life. Therefore, the several drives, the various sensory energies, the developing perceptual responses, must be coordinated. The achievement of a well-organized personality built on effective adjustments is the only kind of life that produces beneficial results. It enables us to know ourselves, to cooperate with others, to understand our own idiosyncrasies that baffle and defeat us, to live progressively, serviceably, and efficiently. Integration indicates psychological coordination; it is an affair of psychological discipline. It means that the component parts of the human mind are assembled into a workable whole. The drives have come to terms with each other, the sensory energies are unified, and perceptions are effective. A settled internal government has been established.

When harmony of our many-sided behavior is achieved; when our fears and hopes, our worries and our anticipations, our successes and even failures are welded into a pattern of understanding and meaning, life assumes a definite form. The best of life is possible. Hence, a well-integrated person can feel, think, and act appropriately in most emergencies and meet life's changing situations with a high degree of success. When a man or woman has shown working examples of this efficiency, then he is adjusted, meaning that the machinery of life, with its bearing on life's demands, is attuned to necessity and circumstance.

So, the goal of normal psychological living is adjustment. It refers to the quality of a person's behavior in terms of effectiveness. His entire psychophysical organism is favorably related to the pressure of life and its complexities are met effectively. Such an individual is free from excessively disturbing inner conflicts which interfere

with the achievements of health and happiness and block the release of his constructive and creative energies. Hence, the inner aspect of adjustment is essentially a process of integration, or psychological government.

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ORIENTATION

Classifications of Personality:

Hippocrates and the four temperaments: phlegmatic, choleric, sanguine, melancholic.

William James: (1) the tender-minded, (2) the tough-minded.

Trait theories.

Jung's extroverts and introverts.

Rosanoff's temperamental types.

Berman's glandular theory.

Kretschmer's theory of character by physique.

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Kinds of Personality

Attempts to arrange personality into different types is very common and a frequent popular pastime. Preciseness in categorizing personalities, however, is almost impossible because of the excessive variability of individuals, their wide habits and experiences, and their personal changes. Yet it has been helpful in public situations to make some effort to label both friend and foe. The attempt to measure personality is really based on individual differences in people, on traits that are difficult to measure with accuracy and security. Personality traits are too numerous and often too widely differentiated to permit single traits to be used as characterizations of the individual. The best that can be done is to observe the interaction of the various traits that might justly describe the individual.

SOME CLASSIFICATIONS OF PERSONALITY

Hippocrates. Some temperaments seem to be naturally low in moods as others are high, just as some days are cloudy and others sunny. The ancient Hippocrates, about 400 B.C., subscribed an influential classification of personality that has been commonly used. Previous to the modern age it was in common acceptance. Hippocrates classified man into four temperaments—the phlegmatic, the choleric, the sanguine, and the melancholic. The phlegmatic temperament was described as slow, weak, impassive, lethargic and stolid; the choleric as quick, alert, easily aroused, fiery, passionate, but lacking in strength and persistence; the sanguine as cheerful, enthusiastic, optimistic, and warm-hearted; the melancholic as depressed, slow, sober, sad and pessimistic. These temperaments were ascribed to “humors” or body fluids which existed disproportionately, some lacking and others existing in excess. The theory has many

assumptions and obviously invites many errors, but it has persisted through the centuries in one way or another, influencing belief in a simple fourfold division of individuals.

William James. The illustrious William James, who pioneered in psychology in the United States, divided mankind in a general way. He proposed two categories: (1) the tender-minded and (2) the tough-minded. The tender-minded is represented by individuals who are guided by rationalistic principles and ideas conforming to ideals and religion. The tough-minded are the practical men influenced by expediency based on facts. This classification is interesting enough but the theory cannot be maintained since there is always a tendency to mix elements of tender-mindedness into the tough-minded, and vice versa.

Trait Theories. Trait theories have been set up for the evaluation of personality, and one of the most recent is that of G. W. Allport.¹ Usually trait theories follow the objective approach, but there are attempts to adopt a dynamic background. Allport is favorable to both lines of argument. He looks upon a trait as "a generalized and focalized neuropsychic system (peculiar to the individual), with a capacity to render many stimuli functionally equivalent, and to initiate and guide consistent (equivalent) forms of adaptive and expressive behavior."

Traits are consistent groups of acts, specific responses which have become organized into patterns of behavior. They are like habits and attitudes, having directive tendencies. Some are native, belonging to the individual's genetic or hereditary background, others are acquired, being products of learning. Some are drives representing physiologic tension, others are purposive and motivational. Sex aggressiveness, for instance, may be native with a strong superstructure of conditioning which is learned or acquired in such a way that the personality of the individual becomes warped by homosexual behaviors. Ambition, tastes, interests are dynamic, purposive, motivational, and show in the development of personality, conforming to a particular style in culture, in education, in religion.

The four temperaments of Hippocrates, the theory of William James, the trait theory of Allport, will serve to indicate examples of how personality types have been classified. Personality classifications

¹ *Personality*, 1937, p. 295.

are too numerous to be enumerated in a few pages, and the reader is directed to the References (p. 241) for further study. It is to be noted that of the many theories of personality a good number have come from investigators in the field of the abnormal manifestations of mind. Some of these classifications proceed from the common forms of mental disorder, ranging from the schizophrenic on one side to the manic-depressive on the other. The schizoid or autistic type, in general, typifies the shy, fantastic, uncommunicative, unsocial individual who shirks his social pleasures. The cycloid or cyclothymic personality, in contrast with the schizoid, typifies an emotionally explosive, unstable man. These characterizations are descriptive of the mentally ill and those of unsound mind. To a comparative degree they are found in the behavior of many apparently normal individuals.

Jung's Extroverts and Introverts. Carl G. Jung, the eminent Swiss psychiatrist, divided humanity into two divergent general attitude types² known as extroverts and introverts. The characteristic differences in these two classes have received popular acclaim and unusual popular appreciation, bringing the terms into common everyday speech.

1. **EXTROVERTS.** The extrovert, dominated by social and external values, is devoted to outside persons and things—he is declared to be the man of action. For him the object plays the determining role, and his attention and interest are on things and events. The inner, subjective life, if considered at all, is reduced to a minimum. Thus the extrovert lives for outward, practical things, and all his conduct is colored in an impersonal way. He is considered to be a man of deed rather than thought.

Four sub-classes qualify extroversion and specify the extroverted attitude to the world. These sub-classes are thinking, feeling, sensation, intuition, and an extrovert adopts one of these specific attitudes in his general behavior. Recognizing these sub-types will prevent the student from making erratic judgments by referring to the extrovert or introvert without further qualification. It must be noted that the thinking and feeling (emotional) extroverts represent the rational class of humankind; the sensation and intuition types the irrational. The former seek to subordinate existence to reason, elimi-

² See Carl G. Jung, *Psychological Types*, 1923.

nating the chaotic and accidental as far as possible. The **thinking-extrovert** glows in facts; the **feeling-extrovert** is dominated by the quest for fellowship and folks. According to Jung, the error of judgment in these rational beings appears when their unconscious experiences are related to the intensely primitive.

The sensation and intuition types are called irrational, contrasting their extroversion with the thinking-feeling extroverts. Their conscious attitudes are said to be empirical, but their judgment in matters of action often exceeds their experience, being liable to distortions of simplicity when their deliberations lean too heavily on the libido, which is the psychic energy deeply resident in an individual—in the unconscious. The **sensation-extrovert** is dominated by pleasure; the **intuitive-extrovert** revels in indirected judgment abundantly glorified by the term “hunches.”

2. **INTROVERTS.** The introvert is the distinctly opposite type from the extrovert. He is a reflector, devoted to his own subjective ideas because his libido flows inward. The subjective factor, according to Jung, consists of the fusing of perceptions and action into a new psychic form in which the object is taken within the ego, making reality something within him. Nature has made provision for him by typical heredity to view all ideas, feelings, sensations, and impulses as belonging to his own subjective life. Here the universe abides, the outer world is unreal, the social world of events unnecessary.

The danger in this general type of introversion is apparent when the objective affairs of daily life are relegated to an inferior and wholly unnecessary interpretation of human experience. Then the introvert becomes psychasthenic, expressing himself by over-sensitiveness and developing a tendency to neurotic exhaustion. In these extreme cases objects arouse fear, yet the introvert is not consciously aware of it because his unconscious is archaic and infantile and needs to be bolstered by development and hardening.

As with extroverts, the introverts are divided into the same subclasses, expressing rational and irrational types. The **thinking-introvert** is concerned with theories applied to himself subjectively. His deliberations are reverted inward and often develop a severe conflict between the individual and his environment. The **feeling-introvert** with his emotional tendencies desires inner harmony, seeking a con-

temptation which depreciates the influences of the outer world. Against these rational types, the irrational sensation and intuitive individuals are placed with their introversions of pleasure and pain. Any mental function may be involved, or a combination of functions may be present, and even a mixture of extroverted and introverted behaviors evidenced; and the conscious may be extroverted in one aspect of life, and the unconscious introverted in another, and vice versa. Thus we arrive at the incredibilities of behavior within the human personality in thoughts, passions, and activities.

Both extrovert and introvert tendencies are basically normal; they become pathologic in extreme cases only. As a general type the extroverts are open, adjustive, daring, social and amenable to human society. The introverts are cautious, reflective, withdrawing, and outwardly reserved. Sometimes they are dominantly secretive and indifferent, being enthralled by the supposed wealth of subjective living. In such cases their social relationships are never exhausted, except by a small companionship of likeminded people. Either the extrovert or the introvert may step beyond the bounds of normality by excesses of conduct or personality defect.

Rosanoff's Temperamental Types.³ Both Jung and Rosanoff are eminent students of psychopathology, and both are agreed that abnormal personalities differ from the normal only in the degree of their traits, not in kind and quality of them.

Rosanoff classified a large number of psychopathic personalities and arrived at four basic types of personality, each being genetically determined. These four types are: the hysteroid, the cycloid, the schizoid, and the epileptoid.

1. **THE HYSTEROID TYPE.** Hysteroid personalities are highly egocentric and antisocial, they lack in scruples and in compunction and exhibit a strong tendency to self-aggrandizement.

2. **THE CYCLOID TYPE.** The cycloids are emotionally disturbed and unstable. They are so emphatic that two sub-types exist, both of which manifest the trait of extroversion. These sub-types are (a) the manic with strong expressions of excitability and the urgent pressure of ideas and action. They derive pleasure in being irascible and thwarted; (b) the second sub-type are the depressives who are sad and slow, discouraged and lacking in ideas.

³ See Aaron J. Rosanoff (editor), *Manual of Psychiatry*, 1927.

3. **THE SCHIZOID.** The schizoids are introverts characterized by certain intellectual traits. Among them are the autistic and the paranoid schizoids. The autistic sub-type is unrealistic, detached, preoccupied, absent-minded, and daydreaming. Because of these unrealities they are always regarded as queer. The paranoid sub-type is stubborn, dominated by fixed ideas, and may have delusions of persecution and grandeur.

4. **THE EPILEPTOID.** Epileptoid personalities are temperamental, moody, often expressing themselves with great ideas, having "inspirations." They show great perseverance in carrying forward a favored project. In many respects they are akin to genius, yet many of their traits are characteristic of epilepsy, though the disease itself may not be present.

Berman's Glandular Theory. Berman ⁴ has produced a classification of six personality types based on the activity of the ductless glands or endocrines. These types are known as the adrenal, pituitary, thyroid, thymo-centric, gonado-centric, and parathyroid. His basic assumption is that the activity of these glands produce emotional-reactions from which temperament, character, and conduct are derived. The glands are the determiners and governors of the personality. They express their behavior in growing life as in the following life-stages: infancy being controlled by the thymus; childhood by the pituitary; adolescence by the gonads; with maturity dependent on the most dominant of the surviving endocrine activities. Old age or senility marks the decline in endocrine activity. Berman's personality types bear interesting behavior characteristics, enumerated as follows:

1. The adrenal personality is marked by vigorous, persistent, energetic behavior. It depends on the action of the adrenal gland.
2. The pituitary personality is marked by intelligence, brain activity with high ability for learning, characterized by self-mastery and self-control. It depends on the pituitary.
3. The thyroid personality is marked by impulsiveness, restlessness, emotional activity. It depends on the dominant action of the thyroid.

⁴ Louis Berman, *The Glands Regulating Personality*, 1928.

4. The **thymo-centric** personality is marked by moral irresponsibilities and is responsible for certain unwholesome behaviors such as homosexual tendencies. It depends on the thymus.
5. The **gonado-centric** personality is marked by emotional prejudices, extremes of emotional behaviors, and sex behaviors. It depends on the gonads.
6. The **parathyroid** personality is marked by high neurotic reactions and hypersensitiveness. It depends on the parathyroids.

Berman's theory errs in its overemphasis and overstress of one group of physical influences. No one doubts that the endocrines do play a major role in personality manifestations, but it is certain that other factors must be reckoned with in evaluating the human personality. And it must not be overlooked that the personality itself may strongly influence the functioning of the endocrine glands.

Kretschmer's Theory. Among the modern German writings on individual types, the work of E. Kretschmer is best known and most widely discussed. The German literature on Kretschmer's method is voluminous. The theory, set forth in a book entitled **Physique and Character** (translated 1925), indicates some close connections between psychiatric types and physical types. Kretschmer observed that certain mental diseases carry an external appearance on the part of the individual that is unmistakable, that schizophrenics and manic-depressives exhibit characteristic physical appearances. By methodically studying these phenomena he arrived at three basic bodily types, which he named asthenic (later leptosomic), pyknic, and athletic. The **asthenic** type is described as long-limbed, long-bodied, and slender; there is a deficiency in thickness, but unusual growth of all parts of the body. Asthenics have been characterized as romantic, idealistic, introvertish. The **pyknic** type is described as a well-rounded, short-limbed, stocky individual with broad face, large neck, deep chest, short and wide hands. They are characterized as jovial, extrovertish. The **athletic** type is the well-muscled, broad-shouldered individual with powerful physical build well above the average.

Kretschmer correlated these three basic types with fundamental kinds of mental disease. In the asthenic and athletic types schizo-

phrenic behavior-tendencies predominated, while in the pyknic, manic-depressive behavior was more in evidence. In 400 cases studied by him 60 were individuals of the pyknic type, and of these 58 suffered from manic-depressive disorder, whereas of the 85 cases of the asthenic type only 4 suffered from manic-depressive psychosis, but 81 were schizophrenic.

In addition to these three basic types, Kretschmer recorded a number of special types which he called dysplastics, whose bodily features were different but among whom schizophrenics predominated.⁵

Attempts to create type distinctions in people are common, in spite of the slowly accumulating scientific evidence against their generalities. Some types are pre-scientific, some are pseudo-scientific, still others are literary—like Nietzsche's dionysians and apollonians, and William Blake's prolific and devouring, Ostwald's romanticists and classicists. In general the theories contain little value in guiding the individual to an adequate adjustment of personality. They are always inconclusive, incomplete, and are but particular aspects common to some individuals, and may not be characteristic of any.

⁵ For further reading, see Richard Müller-Freienfels, *The Evolution of Modern Psychology*, pp. 203 ff.

ORIENTATION

The psychological measurement of personality.

I. Rating Scales.

- A. Descriptive scales
- B. Man-to-man rating scales.
- C. Graphic rating scales.

II. Questionnaires as Personality Inventories.

- A. Some common questionnaires.
 - A-S Reaction Study.
 - Colgate Mental Hygiene Tests.
 - The E.M. Scale of Emotional Maturity
 - Personal Data Sheets.
 - Bernreuter's Personality Inventory.
 - Thurstone's Personality Schedule.
 - Pressey's X-O Tests.

III. Objective Tests of Personality.

- A. Group-Will Temperament Tests.
- B. Ethical Discrimination Test.
- C. Social Intelligence Tests.
- D. Student Rating.
- E. Positive Traits Test.
- F. McCall Inter-Trait Rating Scale.
- G. Bell's Adjustment Inventory.

19

The Psychological Measurement of Personality

The psychological measurement of personality has lagged considerably behind many other phases of human experimentation. The measurement of intelligence and achievement has held the testing fort in recent years, and diagnosis in learning ability has developed advantageously. One reason for the slowness of progress in personality testing is that personality is more difficult to measure than most factors in human behavior. It is so broad and wide that it often seems to defy analysis. However, some efforts have been attended with conspicuous gains, and every attempt shows decided advantage over the stereotyping of personality discussed in the previous chapter.

The psychological measurement of personality has pursued three well-defined lines using: (1) rating scales; (2) questionnaires; and (3) objective tests.

RATING SCALES

Rating scales offer a means of securing qualitative estimates of the degree to which an individual possesses a certain ability or trait. Accordingly, an individual may be rated in general personality, or in one recognized phase of personality, on a point scale ranging from poor to excellent, or low-average-high, or poor-average-good, with numerals designating each unit. Such ratings usually represent the subjective estimates of one to whom the individual is well-known. The value of such ratings will depend on the number of the raters, their collective ability to make a trustworthy appraisal of the individual, and the degree to which traits lend themselves to observation and analysis.

The rating scale is not exactly new, since it has been used in one

form or another throughout the modern history of psychology. It is declared to have been inaugurated by Sir Francis Galton in his volume entitled: *Inquiries into Human Faculty and Its Development*, published in 1883. The rating scale is fundamentally experimental, meaning that it follows the pattern of laboratory psychology. It provides an order of merit whereby individuals are placed comparatively with regard to some trait or traits, the one possessing the highest degree being ranked first, the one possessing the lowest degree of the trait being placed last. Some rating scales are listed presenting illustrations of this point.

Rating scales are numerous, the chief ones being the descriptive, man-to-man, graphic, and numerical tests.

Descriptive Scales. This form of rating uses the terms excellent, good, fair, poor, and seeks to place individuals in one or another of these categories. Obviously only traits that are subject to observation can be rated by this method. The following is an example of the descriptive scale:

Personality				
Industry	Excellent	Good	Fair	Poor
Dependability	Excellent	Good	Fair	Poor
Neatness	Excellent	Good	Fair	Poor
Punctuality	Excellent	Good	Fair	Poor

Man-to-man Rating Scales. The man-to-man scale is designed to facilitate ease and accuracy in estimating the degree to which a person possesses a certain trait. It provides a list of persons who are known to possess the trait and uses them as standards for comparison in measurement. Individuals are compared with these standards and assigned a corresponding rating.

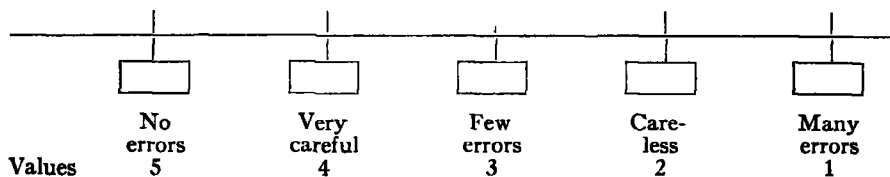
The man-to-man scale was developed during the First World War, by Walter Dill Scott and associates. At that time officers below the rank of brigadier general were rated by their immediate superiors for five traits or characteristics, namely: physical qualities, intelligence, leadership, personal qualities, and general value to the service. The degree to which an officer possessed each of these characteristics

was indicated in a five-step scale, each step having a numerical value showing

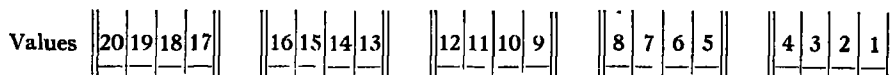
highest	low
high	lowest
middle	

Graphic Rating Scales. Graphic rating scales are in common use and acceptance. They consist of recording a judgment on the degree to which an individual possesses a specified trait. A check or cross is placed at the appropriate designation between the two ends of a line graphically graded from very good to very poor. Graphic scales differ from the man-to-man rating scale with its standards for comparison, and other scales employing the method of checking appropriate responses. The line containing the traits expressing the instruction for testing the trait contains beneath it descriptive phrase-questions intended to define the scale points. The following is an illustration :

Accuracy—Consider the quality of the individual's work



(The scale may be set in the following way, checking and assigning numerical values for each division on the rating line)



A typical graphic rating scale, which may be consulted for further illustration, is: The American Council on Education Rating Scale (Personality Rating Scale), 744 Jackson Place, Washington, D. C.

A brief list of well-used rating scales follows:

Behavior Rating Schedules, by Haggerty-Olson-Wickman. Published by World Book Company, Yonkers, New York. (Designed for testing the behavior of school children.)

North Carolina Rating Scale for Fundamental Traits, by Floyd

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H. Allport. Published by C. H. Stoelting Company, Chicago. (Designed for testing adolescents and adults.)

Sims' Score Card for Socio-Economic Status, by V. M. Sims. Published by Public School Publishing Company, Bloomington, Ill. (Designed for testing school children.)

Whittier Home Rating Scale, by J. H. Williams. Published by the Whittier State School, Calif. (Designed for studying the economic level of the home.)

QUESTIONNAIRES

The questionnaire is similar to the rating scale since both give estimates of the degree to which a trait is possessed. The rating scale is quantitative; it attempts to evaluate and judge personality in some numerical form. The questionnaire, in comparison, represents the individual's thoughts about another individual, expressed systematically. It gives a record of the person by asking questions on specified topics, such as his beliefs, his attitudes, his interests.

Questionnaires are used to secure information on home conditions, environmental facts, interests of people, and other social activities. They are used in psychological estimates and measurements of personality by seeking information on attitudes, adjustments; and in social, economic, and religious issues. They are answered by making a check mark, underscoring, circling symbols such as "L" and "D" (likes, dislikes), and the answers may be treated statistically. In personality measurements such questionnaires are often called personality inventories, and adjustment inventories, because of the manner in which they are supposed to function.

Some Common Questionnaires. The following are personality inventories and adjustment questionnaires:

THE A-S REACTION STUDY. A Scale for Measuring Ascendancy-Submission in Personality, by G. W. and F. H. Allport. (Published by Houghton Mifflin Company, 1928.)

This scale seeks to "discover the disposition of an individual to dominate his fellows (or to be dominated by them) in various face-to-face relationships of everyday life."

COLGATE MENTAL HYGIENE TESTS, PERSONAL INVENTORY B2, by Donald Laird. (Published by the Hamilton Republican, Hamilton, New York, 1925.)

This scale was designed to detect abnormal social and emotional trends in adults, especially for the discovery of psychasthenic, neurasthenic, and schizophrenic tendencies.

THE E.M. SCALE—EMOTIONAL MATURITY SCALE, by R. R. Willoughby. (Published by Stanford University Press, 1931.)

This scale was constructed to evaluate emotional maturity as shown in a person's willingness to accept responsibility, and thus avoid emotional childishness.

PERSONAL DATA SHEET, by R. S. Woodworth. (Published by the C. H. Stoelting Company, Chicago, 1917.)

This instrument has been in popular usage. It estimates an individual's neurotic tendencies as they appear in his emotional life and express themselves in social inadequacies. A revision¹ of the P.D. Sheet was made by S. D. House and is known as Mental Hygiene Inventory, also published by C. H. Stoelting Company, Chicago, 1927. Like its source, the Mental Hygiene Inventory measures neurotic tendencies.

PERSONALITY INVENTORY, by R. G. Bernreuter. (Published by Stanford University Press, 1931.)

This inventory is in extensive use. It measures neurotic tendencies, self-sufficiency, introversion-extroversion, dominance-submission characters in personality.

PERSONALITY SCHEDULE, by L. L. and T. G. Thurstone. (Published by The University of Chicago Press, 1929.)

Like the Woodworth and Bernreuter inventories this Schedule seeks to discover personal and social maladjustments.

¹ Another revision of the Woodworth P.D. Sheet was made by Ellen Mathews. (Published by C. H. Stoelting Company, Chicago, 1923.) It is designed to measure emotional stability in children.

X-O TESTS FOR INVESTIGATING THE EMOTIONS, by S. L. Pressey.
(Published by C. H. Stoelting Company, Chicago, 1920.)

This test seeks to uncover individual differences in people. Two tests are provided: Form A, for adults; and Form B, for children. The differences are sought in moral, emotional and affective attitudes, eccentricities, anxieties and related behavior difficulties.

These few test references will serve to show how the matter of personality is measured by present-day psychologists. It should be noted that there are numerous tests of the inventory or questionnaire variety dealing with introversion and extroversion. In addition there are valuable tests dealing with interests and attitudes, vocational interests, and so on. Even the mention of these instruments will serve to show the breadth and magnitude of personality measurement. And it should be said that the measurement of personality is still in its early years with extensive investigations underway.

OBJECTIVE TESTS OF PERSONALITY

Objective personality tests set before the subject tasks which are scored for amount of work done and the time it takes to do the work. In this respect objective tests differ from the rating scales and questionnaires.

Of the personality tests three may be mentioned for purposes of statement. (1) The prototype of objective tests for measuring personality were devised by June Downey and are known as the **Group-Will-Temperament Tests**. (Published by the World Book Company, New York, 1922.) An individual form of this test is also published. The purpose of this experimentation was to evaluate certain temperamental traits in individuals through simple motor reactions, usually handwriting. (2) A second objective test is the **Ethical Discrimination Test**, by S. C. Kohs. (Published by C. H. Stoelting Company, Chicago, 1922.) This test measures the knowledge of ethical and moral principles by presenting social relations, moral judgment, moral terms, moral problems, and offense evaluation. It represents a beginning in the measurement of the moral side of personality. (3) The third objective test and one that has been widely used is the **Social Intelligence Test**, by F. A. Moss, T. Hunt and

K. T. Omwake. (Published by the Center for Psychological Service, Washington, D. C., 1927.) This test measures an individual's "social intelligence, defined as ability to deal with people." It prescribes judgment in social situations, recognition of the mental state of the speaker, observation of human behavior, memory for names and faces, and sense of humor. See charts on pages 260-261.

McCall has developed an Inter-Trait Rating Scale ² which yields personality quotients in 43 personality areas. For adolescents and adults this scale may be used as a self-rating instrument. The method of the test is to compare the amount of each specified trait possessed by an individual with the amount of some objectively measured trait possessed by him. A sample of the test follows:

<i>Traits</i>	<i>Above or Below Intelligence</i>	<i>Per Cent of Certainty</i>	<i>Personality Quotients ($\frac{1}{2}$ the % plus IQ)</i>
Accuracy Adaptability Cooperativeness Courage Effectiveness Enthusiasm Healthiness Persistence Pleasing Voice Refinement Reliability Tolerance Truthfulness Vivacity			

Average

It will be observed that personality tests ask the individual to answer objectively to items that seek to probe his behavior. A closing illustration, taken from the Student Form of the Bell Adjustment Inventory ³ will indicate the method and questions. This test deals with matters relating to the home, health, social, and emotional

² William A. McCall, *Measurement*, The Macmillan Company, New York, 1939, p. 315.

³ Hugh M. Bell, *The Adjustment Inventory*, Student Form. Stanford University Press, 1934.

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Test yourself (or have some reliable person attempt to test you for student rating on personal traits) by using the following instrument.

Student Rating

What are your outstanding personal traits?

<i>Trait</i>	<i>High</i>			<i>Aver.</i>			<i>Low *</i>		
	1	2	3	1	2	3	1	2	3
Industry...
Accuracy.
Initiative.			
Cooperative			
Tact
Courtesy	
Health...	
Attitude to work	
Speed in work	
Ability to apply technical knowledge	
Quick to observe	
Quick to respond to instructions	
Leadership			

* Rate yourself on a nine-point scale allowing three possible grades for each decision, then draw your profile by connecting the points

List any traits not mentioned that you consider yourself to possess in high degree, and rate them in the same manner.

Have some reliable person test you in the following personality measurement, grading each trait on a four-point scale that may represent the grades A, B, C, D (or underscore the prevailing trait quality).

Positive Traits	A	B	C	D
APPEARANCE	1	2	3	4
Neat	.	.	.	.
Attractive	.	.	.	.
Pleasing	.	.	.	.
Clean	.	.	.	.
APPROACH	1	2	3	4
Aggressive	.	.	.	.
Deliberate	.	.	.	.
Modest	.	.	.	.
Alert	.	.	.	.
Reserved	.	.	.	.
Well-poised	.	.	.	.
Timid	.	.	.	.
SPEECH	1	2	3	4
Precise	.	.	.	.
Refined	.	.	.	.
Animating	.	.	.	.
Convincing	.	.	.	.
Speed	.	.	.	.
INTELLIGENCE	1	2	3	4
Observed by	.	.	.	.
Keeness	.	.	.	.
Well-informed	.	.	.	.
Foresight	.	.	.	.
Practicalness	.	.	.	.
Competent	.	.	.	.
Total values				
	A	B	C	D

adjustments. The directions ask the individual "Are you interested in knowing more about your own personality? If you will answer honestly and thoughtfully all the questions on the pages that follow, it will be possible for you to obtain a better understanding of yourself." The directions point out to the examinee that "there are no right or wrong answers." All the student is required to do is to draw a circle around the word "Yes," the "No," or the "?". The question mark is to be used only when the individual is not certain that he can answer "Yes" or "No." There is no time limit to the test, but the questions should be answered as rapidly as possible.

- Yes No ? Do you enjoy social gatherings just to be with people?
 Yes No ? At a reception or a tea do you seek to meet the important person present?
 Yes No ? Do you take responsibility for introducing people at a party?
 Yes No ? Do you frequently have spells of the "blues"?

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ORIENTATION

Three Classes of People

- A. Failures.
- B. Egocentric.
- C. Integrated.

Normal People with Normal Problems.

How healthy are you psychologically?

Psychological hygiene.

Defense Adjustments and Behaviors.

How do defense mechanisms develop?

Specific defense mechanisms

- A. Compensation.
- B. Identification.
- C. Rationalization.
- D. Withdrawal behaviors.

Daydreaming.

Phantasy.

Disabilities of Adjustment.

Worry.

Anxieties.

Neuroses in the apparently healthy.

- A. Hysterical psychopathic personalities.
- B. Neurasthenic psychopathic personalities.
- C. Psychasthenic psychopathic personalities.

20

Personality and Human Adjustment

One of the greatest expressions of the human personality is to get along well with others. We must adjust ourselves to other persons—our superiors, our friends, and even our foes. We should realize also that adjustment is required of others, and that some succeed where others fail. It will be the task of this chapter to discuss some of the problems of personality and to point out common difficulties met by the average individual in the obligations of adjustment.

THREE GENERAL CLASSES OF PEOPLE

Three general classes of people are met every day. There are, first, a very large number of people who fail to make a success of living; they never arrive at psychological maturity for one reason or another. They cannot meet change with success; they are habitual failures. They are fearful, anxious, angry, nervous. Then, there is a second class of people who manage to keep themselves together but they are unserviceable to their fellows, being victims of a severe egocentricity. They see everything from a selfish, personal angle, and are always absorbed in their own gain, their own power and prestige, subjugating their entire strength to self-interests. Finally, a third group represents the people who have achieved psychological integration, and show it in their behavior. They are well-organized beings, living on a high psychological level. They are coherent, steady, stable, and progressive. They face their struggles with candor and achievement, and at all times qualify for dependability, having attained proficiency in psychological government and discipline.

In everyday life only the effective personality will suffice—the

personality that knows how to work adequately, to relax properly, and to think alertly. This kind of life demands proper food, recreation, and sleep; it calls for physical and mental health so that the individual may become socially fit. Many people suffer from some degree of personality disturbance or deficiency. These inadequacies range all the way from minor and relatively unimportant difficulties to the grave disorders which we speak of as psychopathic behaviors. In any case, personality disturbances rob the individual of his rightful share of happiness, achievement, and success. They show in the isolated behavior of the typically introverted personality, to the excessively extroverted personality. In this mental fray we meet the individual with devastating domestic conflicts, the vocational misfit, the chronic critic, the devious schemer, the dishonest, the lazy and loafing, the parasite. Personality maladjustments will never aid us in achieving a just and abiding peace, because these unhappy possessors of psychological ill-health are captives within the concentration camps of their own mental inefficiencies and inadequacies. They are the human manifesto of unhappiness, unnecessary worries, grumblings, misapprehensions, and pessimisms.

NORMAL PEOPLE WITH NORMAL PROBLEMS

We have pointed out that personality is not born with us although we possess the groundwork out of which it is made. Personality is made with practice, by trial and error and success. It requires the growth of a variety of skills, aided by good health of body and mind. How well an individual stands the strain of peril and difficulty marks him as either a success or failure. We need, therefore, to be well-balanced individuals in a world of social conflict. Who then is the balanced individual? It is the man or woman who possesses a coordinated array of habits, beliefs, feelings, emotions, alert senses, acute perceptions, which culminate in successful thinking and adequate living. Successful thinking develops happiness, serenity, service, anchored in the deeper world of mind. Thereupon the mind has a chance to be at peace with itself, otherwise we are adrift on the sea of our own desperation. The well-coordinated mind is in command of itself. Its integration is expressed by simple yet courageous living, loyal to the laws of its own integrity.

There is always the danger of the normal man or woman faltering, failing, falling from the path of normal behavior, for the line of demarcation between normal and morbid behavior is very thin. At any moment the normal man may fail and become a part of the army of misfits, the mentally sick, and flounder in his normal tasks, swelling the growing tide of human failures. This danger is well illustrated by the fact that the annual increase of mental patients in our hospitals has risen to four and one-half per cent and the rate is rising. It has been authoritatively estimated that in the state of New York one in every twenty-two persons born in the state will go to an institution for mental illness for one kind of treatment or another; that eight million persons among us are mentally ill today (one out of seventeen); that over one half of the hospital beds in this country are occupied by mental patients. Mental illness strikes more people than tuberculosis, infantile paralysis, and cancer together. Such cases represent the extremes of individual failure. There are, however, many people who may never be the victims of such illness but whose temporary and intermediate sicknesses offer them as probable candidates for upsetting maladjustments and corresponding unhappinesses. The entire fabric of our national life is always menaced by the danger of this growth of mental inadequacies. Many of these sicknesses can be largely prevented.

How Healthy Are You Psychologically? This question can be put to any one, at any time. Today we have a democratic right to ask: Are you able to adjust yourself to the mounting difficulties that come with the severe alterations of your ordinary way of life? Are your emotional tendencies a help or a hindrance to your effective behavior? Are you bigoted, excessively prejudiced? Do you get along with people? Do you carry a "chip-on-the-shoulder" attitude? Do you worry about events that you think might come to pass? Are you a victim of fear, of unnecessary haste, of anxiety, of jealousy, mental twists, failures in competition, mental conflicts? Does your social and moral character stand up in a crisis? These interrogations are but samples of the many that could be asked of every one of us, and they all indicate what we are doing with our personality. The manner in which we answer them by our behavior will express our psychological health or lack of it.

To meet the requirements of healthy mental living psychological

hygiene is primarily positive. It consists of forming decisive habits of learning and relearning, of modifying and remodifying our behavior. The consideration of bad habits and disordered functions are really less important in mental hygiene than the demand for the development of sound and normal habits of living. To secure normal habits the preservation of health must occur through favorable growth and development, thereby preventing unnecessary mental decline. The fundamental objective is approved conduct which is attained by physical, mental, and social integrations. In this respect it is a mental hygiene, distinguished from psychiatry which is a department of medicine concerned with the cure of mental sickness. Mental hygiene is an application of positive and normal psychology, seeking to promote the growth of healthy and normal personalities. It is an aid to the individual making proper adjustments in the construction and reconstruction of human personalities.

DEFENSE ADJUSTMENTS

Defense Behaviors. Defense mechanisms are self-protective behaviors whereby an individual attempts to justify his conduct to himself, formulating reasons for his words and deeds which are actually alibis of mental invention. Every individual seeks to defend himself when exposed to criticism or disapproval. It seems to be a natural reaction in all of us to screen ourselves both consciously and unconsciously by inventing various forms of defense when our conduct is attacked, and our behavior blamed for errors or omissions. Accordingly, we conceal or disguise our mistakes, our carelessness, our inferiorities. The tension we experience when we are in error, in criticism, in mental annoyance, is relatively high and the kinds of behavior that we adopt are subtle. Defense behaviors are invented mainly to protect our personality from what we think is abuse or unnecessary criticism. If you are unable to respond to the difficulties in the ordinary situations of life, if the tensions of your everyday labors affect you with an attitude of inferiority, then you will resort to behavior involving some form of defense.

Your attitude of inferiority may be known to you, or it may be cleverly concealed by what is called the unconscious mind; nevertheless, a number of possibilities occur in defensive-adjustment be-

havior. Striking examples of defense-behavior are seen in the individual who falls below the requirements involved in facing competition, criticism, and annoyance. Ponder your reaction when you are faced with the demand to match yourself with another individual considered better in a certain skill than yourself. Do you find yourself steeled for the encounter, or do you make excuses for your shortcomings and slowly give up the effort? The man or the woman who winces at the thought of having to compete on equal terms with friend or foe displays thereby an inferior attitude toward life which forebodes failure. Actually such an individual falls behind before he begins his task, and this is a serious setback.

Criticism Should Lead to Correction. Individuals who are oversensitive when placed in an unfavorable light because of some trivial or tantalizing criticism defend themselves by the means of defense-adjustment. The criticism may be right or wrong, but it is not the criticism you should "worry about"; it is how you react to it, what you do about it. When we fail to react constructively to criticism then it is certain that our inferiority, which is subtle, may not be recognized at all, or if we recognize it we may refuse to do anything about it. The difficulties attached to inferiority are common. They may be disclosed as a new turn in personal character, a product of experiences that make one the victim of thwarted behavior; they may have grown slowly with the years, being residual habits of childhood.

HOW DO DEFENSE MECHANISMS DEVELOP?

Defense mechanisms are not acquired deliberately, usually they steal on us when we are unaware. They tend to make us complacent, seclusive, critical, defending, compromising our weak conduct. Life's prizes are for the brave, the enduring, for the man or woman who can buck the winds of opposition and antagonism, not for those who coddle themselves in the warm air where only tender specimens grow. We must face the future buoyantly, our tasks with optimism and courage. How then do we become victimized by this toxin of self-sufficiency? The first symptom is the habit of escape, withdrawing from obligations of self-integrity. Other symptoms soon follow.

Face Your Difficulties. When we run away from our difficulties, avoid our responsibilities, seek to escape our obligations, withdraw from unpleasant tasks that must be faced, we give evidence of psychological inferiority. Such acts are frustrations of the self and indicate the beginnings of defeat. This habit of escape is manifested in countless ways—in refraining from company when social contacts are necessary, in creating alibis for our shortcomings instead of seeking to remedy them, in avoiding people when we should greet them with a cheer, in assuming that jibes and taunts commonly thrown about are intended for us. Behavior of this kind is psychologically unhealthy because it is occasioned by false reductions of human tension. The tensions of our feeling-life must be reduced, and the best way of reducing them is by normal and positive action, not by responses of avoidance such as sulking and brooding. The facts of life must be faced. Making excuses is of no avail. Alibis, seclusiveness, withdrawals and similar behaviors, are self-imposed defense mechanisms, psychological devices that must be condemned. Shyness, timidity, inflating the ego by imaginary satisfactions are allied mechanisms of false-adjustment. They are useless in situations that demand action. Sometimes, significantly, defense-withdrawal behaviors show in bragging, boasting, blustering conduct. These strange forms are often adopted to cover up the real ills which are slowly submerging into the deep recesses of our nature.

SPECIFIC DEFENSE MECHANISMS

There are so many kinds of behavior that militate against the maintenance of the wholesome personality that an array of labels have been appended to our habits of defense. These names are relatively well known, the more common being compensation, rationalization, phantasy, retrogression.¹

✓ **Compensation.** Compensation is a way of adjusting to conflicts in which situations are opposed one toward another. Certain behaviors are emphasized in order to give satisfaction that will over-

¹ In developing the dynamics of the human mind the Freudians recognize numerous defense mechanisms—displacement, repression, transference, rationalization, projection, conversion, idealization, isolation, introjection, identification, fixation, condensation, symbolization, sublimation.

come dissatisfaction. When a personal insufficiency is recognized it is a simple habit to substitute some other behavior in order to cover up the undesirable conduct. The number of human expressions that may serve as compensations or disguises for less expedient traits is almost endless. Accordingly, the most direct and simplest form of compensation is **overemphasis** of behavior wherein the defect or inferiority or inability appears. Therein the individual covers up or disguises undesirable conduct by introducing a more desirable behavior befitting the immediate use.

NORMAL COMPENSATION. Normally compensation adjusts the individual when he tries to attain a degree of skill, or shows ability along another line of endeavor different from the one in which he knows himself to be inferior. Thus, when ambition has been thwarted by the existence of a known defect, or where ability is known to be lacking, he may attempt to succeed, to shine, in some other manner or way. He may seek to make up his deficiency by success which would bring commendation. To illustrate, a young lady who knows that she does not possess natural charms and finds herself undated because of insufficiency of attraction may compensate by making a high success of some ability. She may seek to excel in music, in business skill, in money-making, or she may attempt to compensate by expensive adornment, if she is financially able to do so. If anyone with the many personal difficulties in everyday life were to allow the sense of insufficiency to grow, fear of shortcomings would inevitably arise and become serious threats to personality stability. In such situations compensation is a normal agent of redress. It should be a principle of our behavior not to allow anything that we cannot do well to absorb our maximum time; rather we should find something that we can do effectively and work at it hard, then compensation will not be necessary because there will be no feeling of insufficiency.

ADVERSE COMPENSATION. There is a negative side to compensation phenomena. It takes us into the borderline of mental ill-health and disturbs the personality adversely by making substitutes for real achievements. Compensations of this kind are reactions to conflict which disrupt mental harmony, conflicts being antagonistic situations which seek equal expression. Reactions to conflict occur in many unfortunate ways and create feelings of unpleasantness. They use many cunning devices, such as gossip, cursing, backbiting, under-

mining, and these often are overcompensations to inferiority expressed with intensity and intolerance.

Identification. Identification is the attempt to attain satisfaction by projecting our own self into another who is what we desire to be. In this kind of behavior the individual achieves, or tries to achieve similarity by real or pretended association with other individuals or groups. Men and women normally identify themselves with organizations making the qualities of the organization their own. It reduces tension and compels action.

In this mechanism there are also negative and unwholesome forms. Naturally we identify ourselves with our possessions, show pride in them, exhibit them, and often boast of them unnecessarily. We have learned to make this adjustment but often forget that in such conduct we expose our deadly selfishness which is, perhaps, the greatest single menace to most men.

Rationalization. Rationalization is the process of finding an excuse for an emotionally determined decision. It is another subtle way taken to overcome an inferiority, by trying to give valid reasons for questionable deeds and thoughts. It is a method of protecting the personality by concealing, often without intention, the real reasons for conduct, inventing elaborate excuses for failures, shortcomings, mistakes. We all use it from time to time. In its explicit manifestations it says: "I could have avoided that accident *had the sun not been in my eyes.*" It is never realistic, but always fanciful, wishful, plausible. The rationalizer never places the blame on himself because he seeks to hide a conflict.

THE STRUCTURE OF RATIONALIZATION. Back of every rationalization are strong drives and motives honeycombed with substitutions, attempted sublimations, engineered to protect ourselves, to garner a defense that shall gain social approval. When the device has done its work there is temporary mental peace, temporary emotional satisfaction, but the adjustment is a makeshift. It has succeeded, so we think, because we have explained our behavior with satisfaction to ourselves. More has been expected of us but we have failed. Our efficiency of mental labor has shown poorly in achievement. Our blameworthy conduct is defended by our ingenious explanations, and so we attempt to protect our ego. What or whom do you blame for your failures, your accidents of body and mind? Do you blame your

training, conspiracies against you, your enemies, the weather, the strange times in which we live? When you do you are doubtlessly rationalizing.

Rationalizations may persist and become so deep in our patterns of living that by the slow process of habit formation they may degenerate into delusions or false belief which reason cannot shake. Then our conduct is obviously false and we are indulging in nothing better than subtly manufactured lies.

SOUR GRAPES AND SWEET LEMONS. There is a pernicious form of rationalization that has gathered the name "sour grapes." You have lost a good job, and now you say: "It was no good anyway." It would be better to acknowledge that you have lost a good job and now are trying to find one as good or better. What is your attitude toward the advancement of friend or foe? Do you acknowledge that he is good, that he has merited promotion, and that you really wish him success, or do you satisfy your mind with excuses and alibis for his promotion? This designation, "sour grapes," takes us back to the old fable of the fox who decides that he does not want the bunch of grapes when he finds that he cannot get them. They are sour, anyway! The victim of rationalization will find some excuse in which to hide his misdemeanor. He will assert that it must be "politics," or that friend or foe is inferior in some other quality which he will name. How uncanny are our reactions when we rationalize! Certain people we would like to know but cannot often brings the statement: "important, to be sure, but dumb," and so we wage a battle to protect our ego.

The "sweet lemon" method of rationalization is merely the reverse of the "sour grape" procedure. Something bad happens to us and instead of admitting to ourselves honestly that it is bad and that, if possible, we ought to put forth an effort to remedy the situation, we justify our failure by calling the lemon sweet.

WITHDRAWAL ADJUSTMENTS

When an individual is thwarted or opposed in his desires, there are several ways in which his behavior may take form. He may withdraw, retreat from the situation, which makes normal adjustment difficult,

and express himself in seclusiveness, in negativisms, in timidity, or in sullenness.

Avoidant Responses. Seclusiveness is always to be condemned. Confronted by an unpleasant situation when emotional tensions are high, withdrawal appears to be natural. It may be expressed in many ways—in isolation from friends, shunning the company of the unpreferred, living alone and apart, pouting, sulking, procrastinating, putting things off when they should not be delayed, withdrawing from events of a public and social nature. Seclusiveness indicates attitudes of inferiority, especially when it has become a chronic habit. Then it may be an expression of conditioned fears which further complicates behavior. In its several forms seclusiveness is a defense mechanism characteristic of individual moods, and is frequently implemented by other difficulties of conduct.

The cause of withdrawal behavior may be occasioned by any kind of abuse, actual or imagined, such as fear, threats of harm, punishments, severe discipline, scolding, overprotection in childhood, not learning to give and take in the many common activities of life. It may be caused by failures, disappointments, and dissatisfactions encountered in life's struggle.

Withdrawal behavior, and avoidant negative behavior, as we have observed, may be passive and quiet, and it may be vigorous, as shown in aggressive forms carried to the point of violence. To this extent it is a form of negativism, an active refusal, an uncompromising stubbornness, rebellion against authority which embodies contradictory attitudes. In everyday life this attitude urges people to get out of doing unpleasant tasks, it expresses itself in "passing the buck," in resisting orders. It makes for quarrelsomeness, and always gives a sense of individual insecurity.

Daydreaming. Besides the general forms of withdrawal expressed in solitariness, seclusive habits, and negativisms, there are other avoidant responses to life. Among these are the pernicious habits of phantasy, daydreaming, wishful thinking, and purposeless imagining. These mental habits play with the representations of a scene hoped for which in reality has no consequence in our progressive living. Daydreaming is an easy outlet at any time and most people use it in many ways. When it is attached to an active ambition it is a normal adjustment; when it appears otherwise it is false, but appears right

because it gives the dreamer an emotional satisfaction. When, therefore, daydreams are excessive, revelling in the glow of imaginary achievement, they are undesirable psychological behaviors. Many individuals of the seclusive, contractive, introvertish kind, deprived of the satisfactions that come from achievement, from social participation, resort to daydreaming as a means of reducing their physical and mental tensions.

Phantasy is building "castles in the air," but the castles must have foundations if they are to stand; they must be anchored to human action, for only then may our dreams come true. When phantasy remains wishful thinking, and takes complete possession of the individual, then it is dangerous behavior because it carries all the ill-omens of disintegration. In the hands of the well-adjusted person phantasy may take the form of creative imagination, become inventive, and provide an outlet for ingenious and progressive thinking and doing. When it becomes a mechanism for the defense of avoidant behavior, for withdrawal conduct, it may develop into a fixed stage of maladjustment. Then it is a contributor to destructive frustration, compensating for real life in a negative manner. But the victim of this state of phantasy finds his daydreaming most pleasant. He nurses it with tenderest care, flinging himself into all the dangers of self-conceit, absurd delusions of power, of success, and of self-importance.

In this frame of mind, riddled with phantasy, the molested self of the ambitious man cannot understand why he does not meet actual praise and progress. He dreams of distinction but his dreams do not actualize. Then he reverses the glow of life, pictures himself as the conquering hero, or goes in the opposite direction and becomes the suffering hero slumping into wearying pessimisms. Victims of phantasy often believe themselves to be martyrs in the social cause, sufferers in a harsh civilization, supposing that political favoritism and social push is more important than brains and ability.

Our flights into phantasy, permitting us to escape reality, sometimes come to us ready-made through adventure stories, love stories, and in some of our movies where we identify ourselves with the thwarted hero, the suffering class, the abused girl, the extravagant male. Anything that takes us away from the sordidness of our penetrating difficulties is a boon to phantasy. When it is a temporary

relief from our conflicts it is not to be condemned. But when it occurs too often or too strongly it is a dangerous and mentally unhealthful behavior.

MAKE YOUR DREAMS COME TRUE. When phantasy becomes more satisfying than the achievement of real things we cease to work for what may become an actuality. Therefore, make your dreams serve constructive ends. Then they are like the soft sands of the stream serving as stepping stones to better based security. Thus, the normal phantasies of life indicating an actual imagination at work create plans that lead to vocational success and creative abilities. Such a mind is in the state of mental incubation, and this creative thinking underlies great accomplishments. Without it there would be no new literature, no new science, no new commerce. Really the test of the validity of phantasy is what it accomplishes constructively. But whether it is normal or otherwise it indicates the drive or motive for compensatory behavior, and none of us escapes this necessity of behavior with its urges and incentives. When, therefore, a coordination exists between the daydreamed satisfactions and actual constructiveness, phantasy is normal because it is ameliorative, recreational, realistic. Such living indicates that the dreamer has used his time profitably.

DISABILITIES OF ADJUSTMENT

The disabilities of adjustment may range from the excessive fears to the extreme psychoses or insanities. We have spoken of fear in our discussion of the emotions. (See page 180.) Worry, so-called "nervousness," the neuroses and psychoses carry man into grave psychological sicknesses.

WORRY

Like fear, but more disintegrating to human life, worry is a disease of civilization, for without social relationships, knowledge, and the ability to reflect, there would be no occasion to worry. Worry starts the moment that human life begins to recognize the sense of responsibility, and the more responsibility one has the greater is the tendency to worry. We worry about anything, small or great, trifles and real troubles, and it is all because man is unprepared to operate his psychological machinery effectively.

Worry Is the Most Negative of the Emotions. Worry is by far the most devastating emotion because civilized life is beset with so much that is fidgety, feverish, restless. Worry lasts longer in ordinary behavior than fear or anger. Even the strong emotions of fear and anger are less irritating in daily life than the petty annoyances and nagging worries that foil us. And to tell one not to worry does little good; advice and suggestion seem to be useless. Man must tackle his own worry by his own strenuous efforts. He must realize his own personal inadequacy, and endeavor to overcome it, for, ordinarily, we create a wrong emotional attitude toward many of our problems and worry grows from it unbidden. In such a state we narrow our mind, we lack mental reserves, we relate ourselves to expected defeat, we are cornered because of psychological unpreparedness. If the dreaded feeling persists we soon lose health and peace of mind.

Worry Impedes Human Success. The irritability of the worrier indicates an inferiority, for worry seldom releases itself fully. It is silently borne, not being explosive like anger. More is held back than is expressed because there is great psychophysiologic tension. The adrenals secrete extra stimulus throwing the organism out of balance, disturbing one or more of the several vital organs. The body is geared for tremendous action, it is keyed up with enormous energy without a proper way for its release. Tension is set up in one direction only, conforming to what one wishes or desires. Life becomes hard, nothing is easy, everything is involved in emotional struggle. Body and mind are disorganized, the deep and well-respected habits are disturbed. A vicious circle is formed, for the more one worries the more he blunders, and the more he blunders the more fretful he becomes. Tension is too great to accommodate itself to the variety of changes that normal life demands and the victim becomes greatly irritable.

Worry Makes Its Victim a Social Nuisance. The worrier always makes a bad impression on others and elicits very little sympathy. In the chronic state he becomes a social nuisance because he is neither pliable nor resourceful. No worrier can be affable, his channels of human devotion are thwarted because of his unrecognized sense of defeat. Normal behavior is thwarted and a subtle jealousy rules his being until the cloud and mist of his behavior lifts. In the state of worry he endangers his progress, for no one enjoys an irri-

tated person. People who make everything a struggle are not wanted in councils.

Worry Invades the Behavior of the Intelligent. The unfortunate fact about this lack of adjustment is that worry is foisted often on people who have excellent minds and splendid capabilities. Many people lose their chance of leadership because of their psychological ill-health. Their loss falls within the circular reaction—they worry and receive no tolerance and thereby generate their own ill-luck.

WHAT CAUSES WORRY?

Worry comes easily to human beings because man possesses a delicate nervous system, finely organized and acutely sensitive. It is frequently abused and soon gets out of commission if not well conserved. Through the centuries of time it has evolved to give man a strength of mind and will to face his life and meet his difficulties. The strain and struggle of life is never easy, the building and conserving of civilization is always fraught with the demand for endurance, alertness, determination. The common symptom of good neural health is normal everyday behavior; hence our behavior betrays us or commends us. Accordingly, man is required by nature to keep his body in good order, and by control and intelligence to reduce his worries to a minimum, if he cannot eliminate them altogether. Why then do we worry?

Poor Physical Condition. Worry is often due to the low ebb or poor condition of some part of our bodily health. A poorly toned body makes for worry, and conversely worry may cause poor physical health. Men and women in ill-health have a tendency to worry even needlessly and over trifles. They may be excused for indulging in gloom and digging their troubles from insecurity. Yet, the worryless individual who suffers from physical ill-health is to be admired, and countless physical sufferers have seemingly conquered this non-adjustive habit of mind.

Worry Is a Bad Habit of Mind. Some people worry without knowing what they are worrying about. Worry, like its opposites—calm, peace, confidence—is an attitude of mind. It shows lack of decisiveness, but some people think it is an inheritance and blame

their racial stock. On the contrary, worry shows poor mental organization which disintegrates the personality.

Improper temperament is a probable cause of worry. In such an event the mental organization is not spontaneously active. In place of alertness and expressiveness there is brooding, self-thinking, self-pity, no thought for others and seldom adequate consideration. This kind of behavior sometimes goes by the name of "psychological selfishness" or the undue expression of the ego. It is different from moral selfishness in that it does not deliberately plan to neglect others with malicious intent. Rather, the individual is introvertish, turning his activity upon himself. Such a habit always breeds sadness and gloom, generating negative qualities of mind of which worry is typical.

Wrong Habits of Action. Worry is caused by improper organization for actually meeting tasks, which prevents efficiency. Hurry as a habit of action creates worry, but this does not mean that one should be sluggish in meeting daily tasks. Life may be met with a dash, but never with nervous dash for this accentuates worry and suggests anxiety. The fear that we shall not arrive on time, not get our work done, represent behaviors that should be condemned. Hurry of this kind creates confusion, accentuates tension, and prevents proper action.

Timidity creates worry. Life is intended to be an expression of confidence, responsibility, self-reliance. The timid man or woman evidences fear which soon becomes worry.

Noncreative Work. Individuals of high intelligence who are forced by the circumstances of life to do routine work without the opportunity for creative expression tend to worry because they lack constructive adventure. When tasks become monotonous the mind is not used fully. This danger must be remedied by introducing a worthwhile hobby. Perfunctory employment always sets the intelligent individual reflecting, wishing, worrying. There is not enough productive activity to set the nervous system and the muscles in worthwhile work. Life is dull, and the organism is kept at a low ebb.

Social and Economic Difficulties. Insecurity of position, disabilities of friends, failure to achieve, ungratified ambitions, loss of employment, all bring their train of regrets, and worry seems inevitable. Physical and mental effectiveness is reduced unless one

can cope with the demands of everyday living, and meet the difficult conditions. What then shall be done with worries?

The Relief of Worry. A few suggestions may aid in the challenge of worry.

KEEP YOURSELF IN GOOD PHYSICAL HEALTH. The body must be kept physically healthy and alert, responding to the obligations of ordinary life with relative ease.

REMEDY YOUR TEMPERAMENTAL DEFECTS. The moods, feelings, and emotions must be built into healthier modes of behavior, toughened, made less afraid of being beaten. Broodings, pessimisms, lonely habits must be overcome. The personality must be ventilated by new interests, greater zest and adventure.

ENDEAVOR TO GET AT THE CAUSE OF WORRY. Discover why you are worrying. Many worries are caused by ignorance and inadequate knowledge. Talk out your worries with someone who can give you competent advice.

BE ACTIVE. Practice responsibility by participation in common activities, by creating hobbies, by engaging in recreation. Such things reduce emotional tension.

OVERCOME YOUR HABIT OF NEEDLESS HASTE. Avoid a nervous, feverish pace. Hurry at best imposes extra fatigue which sooner or later wears a person out. Practice systematic relaxation. By such habits worry is attacked and often completely broken.

ANXIETIES

Worries that become chronic, unchecked by remedial measures, may develop into disorders of the nervous system and invite a neurotic condition.

Are You Nervous? Some people are so irritable without intention, so anxious, fearful, worried without cause, so easily overcome by the strain of life that they excuse themselves by saying they are nervous. To them nervousness is an alibi for an inability. Their use of the word, it should be pointed out, has no support in either medical or psychological literature. Their behavior shows a lack of adjustive response; it manifests unsolved personal problems and "nervousness" indicates unreduced emotional tension, such as fidgety activities, indecisions, cynicisms, grumbling, nagging. Nervous behavior of this

sort is tense behavior, behavior that has lost or never known a proper outlet. Some people of this self-labelled nervous variety imagine they are physically sick when there is no organic disturbance. What is wrong or weak in the nervous person is not his nerves but his habits. The nervous system is not a physical organ like the heart, it is a functional relay of fibers with their dominating cells and synapses. Its organic nervous ills consist of impairment or destruction of the neurons by disease, injury, or inanition. Ordinary nervous people do not fit into this category. Nervous habits and nervous diseases are not to be identified by such scant means as the supposedly "nervous" show.

Overcome Your Nervousness. Ordinary nervousness can be overcome, but it is never easy. If the emotional tension is caused by external conditions that prevent adjustment they should be remedied without delay, and with serious determination. Erroneous external pressures, such as faulty environmental settings, will necessitate a new way of living supporting a demand for changed attitudes of mind. Accordingly, one may have to change his job—he may be a vocational misfit; he may have to change his domestic relationships—marital insecurities may be beyond repair; he may have to change his friendships—his associations may not be conducive to balanced health of mind. But these external conditions usually are not the sole cause of nervousness. They change the stimulus but the true remedy lies in a complete reorganization of the defective personality. Drugs and bromides alleviate nervousness temporarily, depressants lower the reaction tone of the organism and reduce intensity, but the malady needs adjustive treatment whereby the causes are discovered, new attitudes and outlook on life established.

NEUROSES IN THE APPARENTLY HEALTHY

Many individuals, as they grow older, discover that they cannot do their work with ease and soon tire. They are burdened with physical fatigue, irritability, complexes, obsessions, fears, anxieties, and probably perversions. They become emotionally maladjusted in a minor but dangerous manner, and thus are candidates for the true neuroses.

Clinical neuropsychiatrists have specified three well-defined types

of this illness which are generally known as the psychoneuroses: (1) hysteria, (2) neurasthenia, and (3) psychasthenia. These types do not include individuals with severe intellectual defects such as the feeble-minded show, but refer to psychopathic personalities in apparently well individuals—persons who exhibit severe peculiarities of behavior. A brief discussion of their kind will indicate the serious development of “nervousness” into its disintegrating forms.

The Hysterical Type of Psychopathic Personality. The hysterical personality manifests one or more of a wide variety of physical symptoms. Such individuals, although they are without discoverable physical defect or injury, suffer from paralyses, muscular contractions, convulsions, blindness and a hopeless array of physical symptoms.

Hysteria represents a very suggestible condition of behavior in which some idea, or emotion, is indicated in conduct. The hysterical person attempts to express his intense feelings, which are really conflicts of impulses and attitudes showing as an impairment of the body. Severe attacks are usually accompanied, or followed, by partial or complete loss of memory (amnesia, fugue, and dual personality). Various disabilities of sense or muscular movements occur, which show in repressions or conflicts that appear to dominate some physical function.

For the common purpose of our understanding we may regard hysteria as unduly expressed emotional excitability. It is an excessive reaction to an emotional stimulus, an extravagant expression of normal feelings showing in any one of a number of forms. It may appear as excessive self-centeredness, exhibited in a more or less strained, flighty, tense, demonstrative, and emotionally unsatisfied disposition. We meet these cases in everyday life. Generally their causes are to be found in the disorganized personality which must be rebuilt through persistent efforts and treatments, the success of which will enable the individual to make normal social adjustments in behavior.

The Neurasthenic Type of Psychopathic Personality. In neurasthenic personalities there is deep fatigue, vague aches and pains, lassitude, irritability, physical disturbance, a pessimistic outlook on life, and sometimes diffused fear and anxiety. The indisposition is characterized by nervous weakness and exhaustion in

which there is considerable excitement, depression, and anxiety. The designation of the malady was introduced by Beard in 1869 to indicate an ailment believed due to the "strain and stress of modern life." The personal drives and motives come into conflict with the drives and rights of others, and the behavior of the individual is seriously affected. Society requires that these impulses be modified and since it is hard to purify them by ordinary means they exist as troublesome repressions.

The diagnostic classification of "neurasthenia" is open to much controversy. It is so general that many experts regard it as the dumping ground for a multitude of conditions, hence many unaccountable non-adjustive behaviors are branded as neurasthenic. Nervousness, emotional instability, hypochondrias, anxiety states, and many other behaviors find popular lodgment in this category.

The Psychasthenic Type of Psychopathic Personality. The psychasthenic type of nervous disorder often includes anxiety neuroses, obsessional behavior, usually acquired by life's irregular conditioning. The characteristic disabilities are morbid fears, obsessions, compulsions, unhealthy doubts, feelings of inferiority and insufficiency. The development of any one of these symptoms may be gradual, but they are always expressive of emotional strain and stress. Memory plays an important role, and is usually strong and active. It motivates ideas and impulses that are uncontrollable, as in the obsessions. Ideas interfere with ordinary thinking and cause excessive prejudices. They are so persistent that their obsessional development cannot be overcome. They may be expressed in a phobia or abnormal fear, in exaggerated dreads of objects or situations, often symbolized by the dramatic examples of pyromania, characterized by the urge to set destructive fires; by kleptomania, as when a morbid compulsion compels an individual to steal unsuitable things and secrete the collection.

Whatever be the form of nervous illness, the ordinary cases must be checked without delay, and the advanced cases treated by professional skill.



PART FIVE

Applications of Psychology to Nursing

The principles of general psychology which have been set forth in previous chapters have numerous applications for the nurse. A few observations will serve to indicate everyday applications.

THE OBJECTIVES OF THE NURSE'S STUDY OF PSYCHOLOGY

The Curriculum Guide for Schools of Nursing ¹ has specified the objectives in the following statements:

1. To appreciate the importance of a scientific attitude toward human behavior and to gain some understanding of how such an attitude may be developed, and to acquire the ability to study, objectively, the behavior of one's self and others.
2. To learn why and in what respects individuals differ in order to be able to meet these differences intelligently, and if necessary to adjust them.
3. To learn to appreciate the relationships between mental and emotional attitudes and reactions and psychological processes.
4. To learn to apply psychological principles in the development of a wholesome, well-integrated personality.
5. To gain an understanding of those principles of learning and habit formation which help in developing efficient learning technics and good human relationships with patients and co-workers.

What should a nurse know about psychology?

1. Fundamentally, how human nature may be successfully adjusted.

¹ Committee on Curriculum. The National League of Nursing Education. 50 West 50th Street, New York, N. Y., pp. 197-198.

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2. Forces that operate in human life accounting for our manifold behavior.
3. Maladjustments that conflict with normal and approved behavior.

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The Meaning of Psychology for Nurses

THE NURSE'S NEED OF PSYCHOLOGY

In the preceding chapter we have noted the wide area covered by psychology. It is as extensive as human life and social living, and to master all its knowledge would be a formidable and perhaps impossible task. Considering the acquiring of a knowledge of psychology as a problem of selection, what, particularly, should a nurse know about psychology? What use should she make of it? These specific questions will lead us, in the following chapters, to present a systematic discussion which will be the nurse's psychological charter.

Why Should a Nurse Know Psychology? Two irresistible demands impose themselves on all students of human nature, first, to know one's self, and second, to know others. These demands are especially pressing upon all men and women who seek to offer human service in the province of individual and public health. The career of the nurse falls into this category without reservation. She must know all kinds of people from the many angles of living—personalities differing in health and sickness, the variations in human beings which characterize some as sullen and somber, some docile and demure, some tempestuous and fretful, some melancholy and depressed, some anxious, worried, and fearful, as well as those through whom the blithesomeness of normal health bubbles with joy and the satisfaction of living.

No kind of life escapes the nurse, and no category of maladaptation to human living is missing from the range of her wards. To know others is a tremendous challenge to her abilities of heart and mind. Without such knowledge her efficiency and devotion are circumscribed and impaired. With such knowledge her effectiveness is

enhanced. The nurse must know others in the joys and peaceful calm of healthy life; she must know others in the sorrows and sufferings of pain and disease.

To know others, it must be observed, is not a one-sided interest, it is two-fold endeavor behooving the observer to realize that in every human situation there are two individuals who must mutually give and take. Many a person is critical of others, and forgets the faults in himself. To assuage human ills the "beam" in our own eye must be removed as we seek to remove the "mote" in the other's eye. How then shall we know ourselves, and others? The answer is contained in a knowledge of adjustment.

INDIVIDUAL AND SOCIAL ADJUSTMENT

What Is Meant by Adjustment? Psychology in its best applications is really the successful adjustment of human nature, the successful activity of the total organism resulting in a balance between the needs of our basic physiology and the complex and conflicting factors in the life around us. It consists of coordinating our impulses and integrating our personality. That is to say, impulses, which are tendencies to act without thought, propagated within our organisms, must be cooperative rather than conflicting so that behavior is unified, harmonious, balanced. Hence a well-adjusted person can feel, act, and think appropriately in ordinary conduct, and in emergencies meet life's demands with a high degree of success. When a man or woman has made this achievement, and attained a working efficiency, adjustment follows. Such an individual is ready to act healthfully. Human life is fitted into harmonious patterns for living adequately, and progressive behavior is created. The discipline of such a life is a guarantee of successful living.

Psychological adjustment presumes that a well-balanced nervous system functions in the interests of health of body and mind. A strong nervous system gives foundation to adequate thought, will, feelings, moods, endurance, action, courage, and every form of human stability. It was this recognition that led William James to say: "We must make our nervous system our ally, not our foe." When the nervous system is strong, healthy, and functioning properly, there is little chance for besieging worry, anxiety, and similar

fretful states to attack the individual. On the contrary, the determinations of human life—those incentives within and without us—pulse through the nervous system and cause us to act appropriately.

A person is like a nation, the many cells of his body, like the internal and external affairs of a country, must attain reasonable peace and harmony or there is wearing friction. Activities must be harmonized into purpose and power to create progress. Life's determinations thereupon pursue some goal or end through the mental events we call perceiving, remembering, feeling, thinking, acting. By perceiving we take note of what is going on, give meaning to our sensing, and form experience; by remembering we make a record of past events and form pictures; by feeling we secrete our likes and dislikes; by thinking we try to solve our problems and create new modes of living; by acting we set the body in motion seeking life, liberty, and happiness.

Motivations of Human Life. What are the forces of life which operate to make us go, whether it be in the right or wrong direction? They are "drives" and "motives" stirring the nervous and muscular systems to action. Both play important roles in the adjustment or integration of personality.

DRIVES are internal, organic, instinct-like physiologic activities, intraorganic processes which generate stimulation within the body causing tension, or strain, which lead the organism to change or seek a change in behavior. Some drives bid us seek food, mates, offspring; some act in emergencies and serve as a means of awakening ability to escape or defend ourselves. Actually drives are too numerous to be classified and catalogued, especially when we recognize the outlets for this organic energy operating in art, literature, science, religion, commerce, politics, when the stimulating situations relating to these expressions are present.

MOTIVES are a kind of refined drive. Reactions occur from ordinary situations, and in turn become the cause of other higher reactions. Under such transition they are called motives. Hence a motive is ascribed to any condition which predisposes the organism to act in a *preferred* way. When an act is preferred, experience determines an individual's behavior or social conduct. In this manner a motive serves as an incentive, or provides an incentive for acting.

The drives which operate in the adjustment process are mainly physiological. They compel us to seek the necessities of our physical life, and nothing is stronger in the fundamental aspects of living except the freedom to control them by the higher processes of mind, when this ability has been achieved. The motives being incentives to act, advance beyond the foundation of man's physiology and become characteristically psychological. They involve the higher modes of selectivity, choice, preferment, and arise from a knowledge of what to do with the more physiological drives. Drives must have an outlet, they must submit to the testings of common day conduct, and emerge in habits. Thus it is that our habits may be good or bad, a help or a hindrance to personality growth. When an individual learns what he may do deliberately with his basic urges, preferring whatever action he desires, then it may be said that he is "motivating" his social conduct and his adjustment should be secure.

Social Motives. Psychological motives are so closely bound to the effects of daily conduct that they may be called social motives. Here the relationships formed by the individual take on a social significance seen in social interests—the desire to succeed, the desire for prestige, appearance, competition, cooperation, the urge for power and possession. These forces have gathered some intriguing labels. We call them mastery motives, the motive to excel, to succeed, to overcome; social approval motives, the motive to get attention, to seek companionship, to gain the goodwill of people; conformity motives, the motive to do what is expected of us, and so win favor and avoid blame. Probably the motives that urge us to seek security, safety, to acquire wealth and possessions, are too wide to be hemmed within a classification. Because of their frequent breadth they are called "mixed motives." They are prominent in everyday behavior and closely associated with the springs of all human conduct.

The mastery motives are needed by all of us to learn, to overcome our ignorance; the conformity motive is needed in living with others, appreciating their needs, cooperating, making sacrifices for our national and community welfares. Security bids us defend ourselves against attack, deterioration, danger. Acquisition makes us seek to own, to possess, and often degenerates into a selfish consideration, surpassing the bounds of safety. Then it becomes a maladjustment

and a source of individual and social deterioration. Filial and parental love makes for family growth in sentiments, respect, and concern for home relations.

MALADJUSTMENT

Frustration. Motives do not always have the right of way. Sometimes they are prevented from expressing the urge they carry, as when an individual is opposed in his designs, thwarted in his undertakings, defeated in his efforts. Without adequate expression both drives and motives abruptly checked produce a frustrated personality. Frustration indicates defeat, the satisfactory solution of desires and purposes is prevented, the mechanism of human life is thrown out of gear and normal adjustment is impossible. Conflicting impulses gather but they do not cancel each other, rather they increase the difficulties. The individual is involved in strain; suspense, tension, and all kinds of maladjusted behavior are invited. However, this tension or pent-up energy, thwarted incentives, purposes prevented from being achieved, may find the organism restoring its equilibrium and thereby contributing to its own adjustment. On the other hand tension often goes into reverse, and by frustration, or other maladjustment, causes any one of a number of relatively mild peculiarities of conduct. The organism tries to adjust itself in such situations by making false tries that are thought possible of achievement within the framework of circumstances but at best are make-shifts or pseudo-adjustments.

ADJUSTMENT MECHANISMS

Habits. Habits are adjustive mechanisms. By habits individuals make their drives and motives automatic. Comparatively few people have developed their abilities to such an extent that they are able always to make a direct and successful attack on their problems. The demands of everyday life are exacting, severe, subject to success or failure, interspersed with the desires to be lazy, to take our ease, to forget our obligations. We awake to our needs, and in semi-confusion find that we must choose and act quickly. In bewilderment, often, or in a carefree manner we behave habitually, sometimes right and sometimes wrong; hence adjustments are necessary in the life of

every individual. Adjustments are not only necessary but normal. They must be constructive, creative, as natural and necessary as eating and sleeping.

It may be disturbing to know that our normal adjustments to life make use of mechanisms differing only in degree from our maladjustments. So near are we to sanity, and to insanity. Now our behavior is commendable, wholesome, progressive, creative; now it is questionable, querulous, destructive, defeatist. Our excursions into the hinterland of character lead us to despair, and woe betide us if our return to sanity is not immediate. Our human responses to life's situations, time and again, must be salvaged, compensated, refined, made more salutary, more serviceable to the normal course of living. If we remain in the hinterland of our despair we are beside ourselves, and psychologically unhealthy.

We Must Know More About Ourselves. Despite all the human sciences we know too little about behavior. We know more about machines, airships, radios, than we do about ourselves, about the minds that make our machines and our civilization. Our strength of mind, our indomitable spirit, our fortitude, our courage, our creative thought and action, are the best things that we possess, but our wide civilization tears us apart, and we seldom know our behavior.

Knowing Others. Knowing about ourselves should make it relatively easy to project our self-knowledge on others. Not that we should necessarily see ourselves in them, but that we should understand them through our knowledge of psychology. We should learn to recognize behaviors that drive individuals advantageously or otherwise. We should seek to know the characteristics of individual sensory responses, and on a higher plane the individual's interpretation of sense in what we call his perceptions, persisting as memories, and functioning in the meeting of everyday difficulties as in thinking. We should learn to appraise the motives of others in their actions, and so interpret the totality of behavior. By doing so we learn to know the healthy mind in ourselves, and in others, remembering that stability of mind is inevitable.

We can achieve this stability of mind only when we know the involvements of human adjustment, which means that we know

and enjoy psychological health. To know when our thinking is weak, or in error, or in compromise, is an asset to effective living. To know when our drives are too weak, or over-exaggerated, helps us to avoid the pitfalls of foolish and futile adjustments. Therefore we need to know the mechanics and methods of adjustment whereby we achieve the integrated personality; we need to know our quasi-behaviors, our pseudo-adjustments, such as the errors of our wishful thinking, our useless alibis and excuses, our rationalizations, which always show a weakness of behavior that calls for redress and reeducation. We need to know our frights, our fears and worries, our anxieties and our apathies (which arise from boredom), so that maladjustments may be avoided since they indicate a collapse of psychological health inviting grave personal and social perils. Adjustment, then, indicates harmony, unification, balance, or the integration of our personal abilities which produce a sane, safe, and satisfying condition of psychological health. This knowledge is the meaning of psychology to the nurse. By it one's own life and the life of others are effectively and appropriately interpreted and appraised.

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ORIENTATION

How does psychology seek to understand the individual and offer help and guidance?

Building a Psychological Profile : by Observation ; by Experiment.

- 1. Instruments for developing a psychological profile.**
 - A. Ascertaining physiologic characteristics.**
 - B. Gathering data on mental characteristics.**
 - C. Discovering emotional stability.**
 - D. Grading students in nursing education.**
 - E. Moral characteristics.**
- 2. Case histories.**
- 3. Concomitants of retardation.**

Diagnostic Procedures.

- 1. Visual responses.**
- 2. Auditory responses.**
- 3. Motor strength, steadiness, and skill.**
- 4. Attention and observation.**
- 5. Perceptual responses.**
- 6. Learning.**
- 7. Memory.**
- 8. Emotions.**
- 9. Nurse's aptitude.**
- 10. Intelligence.**
- 11. Reading.**

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Clinical Psychology

The Clinical Section of The American Association for Applied Psychology, in 1935, secured statements from many prominent psychologists whose major work was concerned with human adjustment problems. From these statements the committee formulated the following definition of clinical psychology :

“Clinical psychology is a form of applied psychology which aims to define the behavior capacities and behavior characteristics of an individual through methods of measurement, analysis, and observation ; and which, on the basis of an integration of these findings with data secured from the physical examinations and social histories, gives suggestions and recommendations for the proper adjustment of the individual.” ¹

How, then, does the psychologist seek to understand the individual, and how may this knowledge be of service to anyone interested in public health and social adjustments? The question is answered by specifying two groups of psychological interests, namely: the compilation of an analytical profile of the individual, and the use of psychometrics. For the purpose of psychological adjustments, the first interest is concerned with writing a full account of the individual so that a psychological supplement is provided for a fuller case history. The second interest provides the means for pursuing exact diagnostic examinations, which are psychometric. Within these two methods complete psychological knowledge of the individual may take form.

BUILDING A PSYCHOLOGICAL PROFILE

The compilation of a psychological profile represents an inclusive assemblage of mental traits characteristic of the individual who is

¹ C. M. Louttit, *Clinical Psychology*, 1936, p. 4

being examined, in so far as these traits can be determined quantitatively. It is an objective attempt to gather essential facts, and forms part of the more extensive psychoclinical examination. The profile may be general, or it may take into account one or more groups of human behavior, subject to the needs of the inquiry. When this information is completely and accurately gathered it may be written in graphic form.

Methods of Building a Psychological Profile. Two fundamental methods are employed by the psychologist in making a clinical analysis, namely: observation and experiment.

OBSERVATION. The common way of eliciting information concerning the psychological responses of others is by studying their behavior, which means taking into account the muscular, glandular, and verbal responses or lack of them. This is done primarily by observation, which is noting, inspecting, observing the manifest reactions of an individual. We may observe how an individual expresses himself in everyday behavior, in sickness, in crisis, in emergency, and so on. We may observe his quickness or slowness of response, his emotional calm or excitability, how he attends, discriminates, how he learns, profits by experience, and innumerable other aspects of his everyday conduct. This type of observation offers a common-sense picture of the individual's behavior. The success of the method depends upon knowing what to look for in the nature of human traits, and checking them completely and accurately in a systematic manner.

EXPERIMENT. This method advances the psychoclinical procedure into accuracy and precision. It is the method of the laboratory which tests observation under controlled and standardized conditions. It obtains measurements by controlling observations, making them precise and scientifically factual. Within the scope of psychological experimentation is the method of diagnostic testing which uses standardized tests for the eliciting of trustworthy data.

A Suggested Psychological Profile. The following material will illustrate probabilities for physiologic, mental, and personality traits, descriptive of the general discussion of this text. It will show the traits that may be used in the compiling of a usable profile in ordinary public health situations. The statements are suggestive and flexible, they are not a blue-print, and are not necessarily final. Other

instruments may be built in like manner, and a method of computing the findings established.

A PSYCHOLOGICAL PROFILE FOR CHILD OR YOUTH

(It is always important to collect vital personal data at the beginning of any inquiry, as shown in the following form.)

Name Date
 Address
 Birthplace
 Date of birth Sex
 CA (Chronological age)
 IQ (Intelligence quotient) MA (Mental age)
 Other psychological tests (stated)

Heritage

Father's name Where born? Age
 Place of residence
 Occupations
 Adjustment histories

Mother's name Where born? Age
 Places of residence
 Occupations
 Adjustment histories

Home environment (classified)
 Brothers Ages
 Sisters Ages

Profile instruments may be variously written. In the following illustration on physiological characteristics, sense abilities and disabilities are to be reported on examination. This method of recording is simple, and consists of writing statements secured from reliable sources, such as clinical observation, experimentation, and analysis,

Physiological Characteristics

Sense abilities:

Vision Normal
 Defects

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Sense abilities:

Hearing	Normal
	Defects
Taste	Normal
	Defects
	Peculiarities
Smell	Normal
	Defects
	Peculiarities
Touch	Normal
	Peculiarities (in pain)
	(in temperature senses)
Motor senses	Normal
	Disorders of balance
	Disorders of position
	Disorders of standing
	Disorders of sitting
	Disorders of walking
Organic senses	Normal
	Disorders of thirst
	Disorders of hunger
	Disorders of breathing
	Intestinal disorders
	Circulatory disorders
Height	Other characterizations
	Weight (Compare height and weight charts where necessary)

The following are the Baldwin-Wood Height and Weight Tables *
useful in anthropometric measures:

* Henry E. Garrett and Matthew R. Schneck, *Psychological Tests, Methods, and Results*, New York, Harper and Brothers, 1933, pp. 9-11. (Reproduced by permission.)

WEIGHT-HEIGHT-AGE TABLE FOR GIRLS

Height in Inches	Average Weight in Pounds	Age																
		5	6	7	8	9	10	11	12	13	14	15	16	17	18			
38	33	33	33															
39	34	34	34															
40	36	36	36	36														
41	37	37	37	37														
42	39	39	39	39														
43	41	41	41	41	41													
44	42	42	42	42	42													
45	45	45	45	45	45	45												
46	47	47	47	47	48	48												
47	50	49	50	50	50	50	50											
48	52	52	52	52	52	53	53											
49	55	54	54	55	55	56	56											
50	58	56	56	57	58	59	61	62										
51	61		59	60	61	61	63	65										
52	64		63	64	64	64	65	67										
53	68		66	67	67	68	68	69	71									
54	71			69	70	70	71	71	73									
55	75			72	74	74	74	75	77	78								
56	79				76	78	78	79	81	83								
57	84				80	82	82	82	84	88	92							
58	89					84	86	86	88	93	96	101						
59	95					87	90	90	92	96	100	103	104					
60	101					91	95	95	97	101	105	108	109	111				
61	108						99	100	101	105	108	112	113	116				
62	114						104	105	106	109	113	115	117	118				
63	118							110	110	112	116	117	119	120				
64	121							114	115	117	119	120	122	123				
65	125							118	120	121	122	123	125	126				
66	129								124	124	125	128	129	130				
67	133								128	130	131	133	133	135				
68	138								131	133	135	136	138	138				
69	142									135	137	138	140	142				
70	144										136	138	140	142	144			
71	145											138	140	142	144	145		

WEIGHT-HEIGHT-AGE TABLE FOR WOMEN

Height in Inches	Age									
	19	20	21-22	23-24	25-29	30-34	35-39	40-44	45-49	50-54
58	104	106	108	110	113	116	119	123	126	129
59	106	107	109	112	115	118	121	125	128	131
60	112	112	113	115	117	120	123	127	130	133
61	116	116	116	118	119	122	125	129	132	135
62	118	118	119	120	121	124	127	132	135	138
63	120	121	122	123	124	127	130	135	138	141
64	123	124	125	126	128	131	134	138	141	144
65	126	127	128	129	131	134	138	142	145	148
66	130	131	132	133	135	138	142	146	149	152
67	135	135	135	137	139	142	146	150	153	156
68	138	138	139	141	143	146	150	154	157	161
69	142	142	142	145	147	150	154	158	161	165
70	144	144	145	148	151	154	157	161	164	169
71	146	147	149	151	155	157	160	164	168	173
72	150	152	154	156	158	161	163	167	171	176

WEIGHT-HEIGHT-AGE TABLE FOR BOYS

Height in Inches	Average Weight in Pounds	Age																
		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		
38	34	34	34															
39	35	35	35															
40	36	36	36															
41	38	38	38	38														
42	39	39	39	39	39													
43	41	41	41	41	41	41												
44	44	44	44	44	44	44												
45	46	46	46	46	46	46	46											
46	48	47	48	48	48	48	48											
47	50	49	50	50	50	50	50	50										
48	53		52	53	53	53	53	53										
49	55		55	55	55	55	55	55	55									
50	58		57	58	58	58	58	58	58	58								
51	61			61	61	61	61	61	61	61								
52	64			63	64	64	64	64	64	64	64							
53	68			66	67	67	67	67	68	68	68	64						
54	71				70	70	70	70	71	71	71	72						
55	74				72	72	73	73	74	74	74	74						
56	78				75	76	77	77	77	77	78	78	80					
57	82					79	80	81	81	82	83	83						
58	85					83	84	84	85	85	86	87						
59	89						87	88	89	89	90	90	90					
60	94						91	92	92	93	94	95	96					
61	99							95	96	97	99	100	103	106				
62	104							100	101	102	103	104	107	111	116			
63	111							105	106	107	108	110	113	118	123	127		
64	117								109	111	113	115	117	121	126	130		
65	123								114	117	118	120	122	127	131	134		
66	129									119	122	125	128	132	136	139		
67	133									124	128	130	134	136	139	142		
68	139										134	134	137	141	143	147		
69	144											137	139	143	146	149	152	
70	147												143	144	145	148	151	155
71	152													148	150	151	152	154
72	157														153	155	156	158
73	163															157	160	162
74	169																160	164

WEIGHT-HEIGHT-AGE TABLE FOR MEN

Height in Inches	Age										
	19	20	21-22	23-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
60	111	112	114	118	122	126	128	131	133	134	135
61	116	117	118	121	124	128	130	133	135	136	137
62	122	123	124	125	126	130	132	135	137	138	139
63	127	128	128	129	131	133	135	138	140	141	142
64	130	131	132	134	135	136	138	141	143	144	145
65	134	135	136	137	138	140	142	145	147	148	149
66	139	140	141	142	143	144	146	149	151	152	153
67	142	143	144	145	146	148	150	153	155	156	158
68	147	148	149	150	151	152	153	158	160	161	163
69	152	153	154	155	156	158	160	163	165	166	168
70	155	156	157	158	159	162	165	168	170	171	173
71	159	160	161	162	164	166	170	174	176	177	178
72	163	164	165	166	168	172	176	180	182	183	184
73	167	168	169	171	173	178	183	186	188	190	191
74	171	172	174	176	179	184	189	193	195	197	198
75	175	175	178	181	184	190	195	200	202	204	205
76	178	180	183	186	189	196	201	206	209	211	212
77	183	185	188	191	194	201	207	212	215	217	219

DATA ON MENTAL CHARACTERISTICS

The following instrument for inscribing mental characteristics shows a method of scoring, giving the range as low, average, high. The selected tests may be formal or informal, and the scoring results joined by connecting lines which in itself will indicate the variety of reaction, and present a profile.

MENTAL CHARACTERISTICS

<i>Test</i>	<i>Scoring Range</i>		
	<i>Low</i>	<i>Average</i>	<i>High</i>
Learning ability	.	.	.
Sustained attention	.	.	.
Power of comprehension	.	.	.
Breadth of interest	.	.	.
Studiousness	.	.	.
Persistence	.	.	.
Intellectual curiosity	.	.	.
Intellectual modesty	.	.	.
Insight	.	.	.
Foresight	.	.	.
Openmindedness	.	.	.
Intellectual initiative	.	.	.
Mental judgment	.	.	.

Possible profile showing mental characteristics of a brilliant youth who may have delinquent tendencies

EMOTIONAL STABILITY

Instruments of this kind and those that follow are mostly rating scales, which are illustrated elsewhere in this text. They may be prepared as we have described, or they may be written for the recording of responses as excellent, good, fair, poor, or they may be scaled numerically. The following questions on emotional stability, and emotional adjustments will express another form, from which profiles may be drawn :

	I <i>Excellent</i>				II <i>Good</i>				III <i>Fair</i>				IV <i>Poor</i>			
Emotional Stability																
Human sympathy . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Cheerfulness . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Attitude toward others . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Attitude toward work . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Emotional Adjustments																
Courtesy . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dependability . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Reliability . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Usefulness . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sense of humor . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Unselfishness . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Generosity . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Punctuality . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Happiness . . . . .	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	<i>Excellent</i> I				<i>Good</i> II				<i>Fair</i> III				<i>Poor</i> IV			

The first form is preferable but the second may be used. The four dots in each column may represent the gradings A, B, C, D, or 1, 2, 3, 4.

GENERAL STUDENT EFFICIENCY IN CANDIDATE NURSES

The following instrument is another form of evaluation which may be used in securing a scaled answer evidencing professional efficiency. It is specified for nurses but may be adapted for almost any type of student in training.

Name of Examinee

Please indicate by checking the following scale at the point where you think the student named above fits your knowledge of her ability and aptitude.

	One of the best students I have come in contact with anywhere.				Good student making satisfactory progress.				Poor student. Needs considerable attention and help.				Very poor student. Should be discouraged from remaining in training.			
Value points	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Check on the above scale conscientiously

Name of rater _____ Date _____
 Position _____
 Address _____
 Specify amount of contact with examinee _____

Another form may be made in calculations by addition, as in the following:

MORAL CHARACTERISTICS

	<i>Excellent</i>				<i>Good</i>				<i>Fair</i>				<i>Poor</i>			
	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1
Conscientiousness
Honesty
Service to society
Love of truth
Neatness
Gratitude
Integrity.
Totals																

Characteristics may be examined by means of formal testing, careful observation, and other reliable forms of examination.

Profile Charts. Profile charts in the method of education and related activities are adjustment tools, providing information gathered by scientific means. They are plotted records showing accurate reactions. Many standardized tests provide them in the form of charts, offering places for the scores and their graphical representation. Many are relatively simple, after the manner of our illustra-

tions in the previous pages, and many are elaborate and involved. Greene, Jorgensen, and Gerberich, in *Measurement and Evaluation in the Secondary School*,⁸ discussing the use of test results in pupil adjustment in school, have given sample profiles in operation. In these pages there is a sample of a "diagnostic profile chart" for a 10th grade pupil's achievement in reading vocabulary, reading comprehension, mathematical reasoning, mathematical fundamentals, and language. A sample profile chart of educational development for social studies background, correctness in writing, quantitative thinking, reading, social studies, natural sciences, literature, general vocabulary, is also given, along with sample profiles for achievement tests, and the California Test of Personality. This latter profile considers the components of self and social adjustment, self-adjustment being divided into self-reliance, sense of personal worth, sense of personal freedom, freedom of belonging, freedom from withdrawing tendencies and freedom from nervous symptoms. Social adjustment deals with social standards, social skills, freedom from anti-social tendencies, family relations, school relations, and community relations.

CASE HISTORIES

A case history is drawn from all available information giving a record of the individual concerned, prepared from interviews and from data received or obtained from various institutional records, such as those of the school, the hospital, the social-work agency, the clinic, the business or firm, the correctional institution. It will cover the neglected, the delinquent, the dependent, in the matter of either children or adults. It is a sort of autobiography, a life-history presenting accurate information covering the individual's personality development in all its possible phases. The information should be specific, objective, constructed as a natural, normal document, preferably developed after an interview. The principal parts of a case history are as follows:

I. FAMILY DATA. Age, sex, and names of parents, children, with full residential history, background. Occupation of the individual

⁸ Harry A. Greene, Albert N. Jorgensen, and J. Raymond Gerberich, *Measurement and Evaluation in the Secondary School*, Longmans, Green and Company, New York, 1943, p. 276 ff.

(or parents, if the examinee is a minor). Religious affiliation. Status of family in the community. Health. Education. Political relations.

II. DEVELOPMENTAL HISTORY OF THE INDIVIDUAL.

- (a) **For a Child:** Mother-child relationships, including habit training indicating feeding, sleep, play, etc. Disciplinary habits, self-control, favors. Father-child relationships, demands imposed on child for domestic compliance and obedience. Disciplinary conflicts, favoritisms, loyalties. Intersibling relationships indicating affections, rivalries, indifferences. Playmates and companionships, gang contacts.
- Relations to community and neighborhood specifying whether friendly or otherwise, respect concerning properties of others, and authorities. School contacts and adjustments with teacher, other pupils, and progress in educational growth and abilities.

The child's responses should be enumerated in regard to his home and school training, recording:

His dependencies on mother, father, brothers, sisters, teachers, playmates.

His emotional reactions showing frustrations, fears, aggressions, compulsions, resistant behaviors, loves, hates.

His emotional outlets indicating his preferences in reading, movies, radio, play habits.

His fundamental interests, hobbies, vocational aspirations.

His personality growth recording any evidences of inferiority feelings and how they are met. His daydreaming, compensations, rationalizations, projections, alibis, withdrawal behaviors. His growth in self-confidence, self-assurance, self-reliance. His readiness to assume responsibilities, willingness to work either at home or elsewhere. His moral sensitivity to recognize error, guilt, and take blame for his observed faults. His social appreciation for others, and his general happiness displayed through the various behaviors of childhood.

There are numerous helps in eliciting data of this kind. Most institutions have printed matter that is helpful, and all clinics are relatively well-stocked with such instruments.

(b) **Adolescence:** Information gathered regarding adolescents follows the same general pattern as in the case of the child. Here,

however, it should be observed that pubertal changes by their very nature constitute a wholly different individual. Conflicts are more numerous, the desire for independence is normally paramount with a minimum of dependency attachments. With the urge for social emancipation in adolescence goes a normal development in heterosexual interests, and with it there should arise a social sense of responsibility and self-control. The major factors in compiling case histories of adolescents may be enumerated as follows:

Parent-adolescent relationships indicating sympathetic guidance and training, offering growth in adequate affections especially within the family circle.

Friendship and group contacts indicating the facilities for recreation, extension of social contacts with their normal romances.

Adequate contacts with religious, political, vocational, educational groups.

The case history should record the frustrations, anxieties, conflicts, recognizing the normalcy of physical growth, mental and social habits and attitudes, and sex and related behaviors. It should take note of the successes made by the individual in his emotional securities or failures, in emotional strength, emotional balance, with their relationships to the essential adjustments in self-confidence and self-control, and moral implications and obligations.

The Interpretation of Case Histories. Case histories should be interpreted by trained and competent people who have acquired the skill through a long period of professional training. Inexperience in handling crucial case data is dangerous.

The case history shows the circumstances through which the individual has developed. It shows in recorded form the complexities and confusions through which his life has passed. Forms, blanks, and similar instruments if not provided may be made by the investigator, but they should give a thorough and exhaustive record. The case history gathers needed information for analyzing the problem and should reveal the hazards of the case whether the individual be a child, a youth, or an adult. In its fullest form it collects the family history, the family background, the physical, mental, social,

and cultural development of the individual. But it is only a background providing a picture of the individual's life-history.

How Case Histories May be Used. If the case history is adequate and accurate it is usually one of the most valuable instruments of the professional worker, whether physician, psychologist, social worker, or nurse. It supplements, or is supplemented by the psychological profile, giving physical, mental, social, economic, and cultural data. But it is not a magic document that in itself arrests the prevailing distress for it cannot be standardized, and it is never final. In some instances it may be of little or even no value in the treatment of the case and can be discarded with profit. This is one reason why formal case histories are being used less frequently today than in the past.

A SUMMARY OF THE DEVELOPMENT OF RETARDATION

The following schema ⁴ shows in summary form how the various senses, dealt with in Parts Two and Three of this text, may through their defects produce psychological, educational, and social disabilities. An ametropic defect of the eye, for example, may produce certain psychological defects, such as imperfect perceptions, poor memory ability, disabilities in thinking, and probably nervousness. As a consequence of psychological disturbances educational products are impeded. In such a case a child, for instance, may not be able to read, spell, or draw. The gross product of psychological and educational disabilities is more than likely to cause social disturbances, exemplified in bad habits, undue timidity, inferiority, and so forth.

⁴ J. E. Bentley, *Problem Children*, New York, Norton, 1936, pp. 346-353.

A SUMMARY OF THE CAUSES OF RETARDATION IN PROBLEM CHILDREN

I Physical Senses	Defect	II <i>Psychological Effects</i> (As a consequence of physical defects)	III <i>Educational Effects</i>	IV <i>Social Effects</i>
Eye (vision)	Ametropia (a) Myopia (b) Hyperopia (c) Hypermetropia Strabismus (a) Esotropia (b) Exotropia (c) Diplopia	Blurred and imperfect visual images, faulty perception Inadequate concentration Poor memory ability Disabilities in thinking Nervousness	Reading Space relation subjects Writing Drawing Geometry, etc. Physical education (uncoordinated) Verbal description Spelling	Lack of initiative Timidness Dependent thought and action Passivity Inferiority Depressive Bad habits
Ear (auditory)	Cerumen (wax) Otitis media Inner ear disturbances	Blurred and imperfect auditory images, perception Defective imagination Interference with language functions Poor concentration Nervousness	Speech Limited vocabulary Language perversions Music	Self-consciousness Dependence Inferiority Imitation faulty Social "instincts" perverted Malformed habits
Skin (touch) Dermal	Tactual disabilities Anesthesia	Tactual images not clear Nervousness	Motor skills Penmanship Handwork Tool subjects	Poor judgment Faulty imagination Discrepancies between thought and action
Nose (smell) Olfactory	Obstructions Adenoids Sinus infections Catarrh Polypi Hanging turbinates Malformed septum	Blurred images in smell and taste Defective comprehension Unstained intellectual processes, perception, memory, etc. Nervousness	Speech	Self-consciousness Listless Inferiority Malformed habits

A SUMMARY OF THE CAUSES OF RETARDATION IN PROBLEM CHILDREN
(Continued)

I Physical Senses	Defect	II <i>Psychological Effects</i> (As a consequence of physical defects)	III <i>Educational Effects</i>	IV <i>Social Effects</i>
Skeletal structures Viscera Thalami	Gastric disorders	Emotions Depression Melancholia Hypochondria Euphoria Passive Active	Slowing down of motor skills Depreciation in reading arithmetic language spelling and related disabilities	Indifference Lack of enthusiasm Restlessness, inaction Bluntness of manner Oversensitiveness Lack of tolerance and feeling appreciation
Brain	Aprosexia Aboulia Disboulia Hyperprosexia Paraprosexia	Attention defects Distractibility Lack of concentration Decrease in mental efficiency Lack of purpose Short memory span Lack of durability in memory	All school subjects	Rudeness Personality defects Introversion
		Discrimination defects Lack of discrimination ability in weight, form (spatial relations), tone Inability to perceive, recognize, etc. Lack of imagination		
		Observation defects Poor attention Inability to form adequate perceptions	Lack of descriptive ability scientific ability	Inability to operate machines, automobiles, etc. Lack of success in plays and games

A SUMMARY OF THE CAUSES OF RETARDATION IN PROBLEM CHILDREN
(Continued)

I Physical Senses	Defect	II Psychological Effects (As a consequence of physical defects)	III Educational Effects	IV Social Effects
Brain (continued)	Memory disabilities Amnesia Hypermnnesia Paramnesia Illusions of recognition	Memory disorders Lack of association Poor attention Lack of will power Small capacity for rational reconstruction Low comprehension Inability to recognize, retain and remember Fabrication Retrospective fabrication	All subjects	Loss of personal identity causing inability to adjust oneself to environment Poor judgment Dissociated personality Fabrication of personality
Brain General organism		Reasoning disabilities Poor judgment False judgment Lack of knowledge and experience Prejudice in thinking	Arithmetic Language Composition Logic	Lack of creative imagination Indecision Hasty judgments Inability to solve everyday problems of behavior Jumping at conclusions Poor critical ability
		Personality disorders Mental conflict Dissociation of personality Weakness of personality Transformation of personality Lack of ideas, feelings, impulses Changes of mood with resulting changes in ideation, interests Worry Anxiety Indirect expression	All subjects	Social effects of disordered personality Split personality Extreme extraversion Extreme introversion

A SUMMARY OF THE CAUSES OF RETARDATION IN PROBLEM CHILDREN
(Continued)

I <i>Physical Senses</i>	<i>Defect</i>	II <i>Psychological Effects (As a consequence of physical defects)</i>	III <i>Educational Effects</i>	IV <i>Social Effects</i>
Spinal Muscles, tendons, joints Feet, legs Arms	Curvature Kyphosis posture Lordosis defects Scoliosis Lack of coordination Lack of coordination Lack of coordination	Neuro-muscular imbalance Kinesthetic disabilities, motor disturbances Kinesthetic disabilities, motor disturbances Kinesthetic disabilities, motor disturbances	Motor skills Penmanship Handwork Drawing Motor activities, etc.	Awkwardness General social maladjustment
Teeth	Malformed structures Obtruded teeth Intruded teeth	Nervousness	Speech	Self-consciousness Inferiority
Jaws	Malformed structures Overshot Undershot Open-bite	Nervousness	Speech	Self-consciousness Inferiority
Glands	Thyroid Myxoedemia Cretinism Pituitary Dwarfism Giantism (acromegaly) Thymus (affects growth) Adrenal (stimulates heart)	Interferes with general mental processes, especially attention, memory	Subjects in general	Self-consciousness Inferiority Personality defects

DIAGNOSTIC PROCEDURES

In the application of psychology one should take note of the fact that modern psychology operates as a natural science. It pursues objective methods, and uses the objective means of instrumentation in its fundamental approach to the understanding of human behavior. In dealing with children the common apparatus used in human physiology laboratories are always in demand, such as the stadiometer for measuring height, platform scales for measuring weight, the dynamometers for measuring strength reactions, radiometers for measuring head length and breadth. The more advanced forms of laboratory instrumentation, used in experimental psychological research studies, show how very carefully, minutely, and precisely, the sensory, perceptual and higher psychological responses are made. Problems in sense behavior, such as vision, hearing, taste and smell, the motor senses, and the organic reactions involve rather elaborate psychological procedures and the use of highly organized methods and instruments. The notion that psychology uses a lot of guess-work and common-sense assumptions, must be abandoned, and will be, when the public becomes acquainted with the methods of the psychological laboratory. This recognition will throw light at once on the references to the objective method made in the opening chapter of this text.

Psychological Tests. Psychology's contribution to human life in making and giving tests to individuals is most significant. It has opened a new approach in dealing with people. Tests are experimental because they are psychometric in their methods and procedures. They represent an objective approach to an individual's behavior. Their fundamental purpose and function is clinical, measuring objectively the attitudes, abilities, achievements of individuals. Tests have been devised for all sorts of activities, such as physical and sensory capacities, intelligence and achievement, perception, memory, attention, learning, motor and mechanical abilities, aptitudes in special fields. Among these fields are included the fine arts, music, clerical work, typewriting, nursing, some professions—notably medicine, law, engineering, and the measurement of personality.

From these tests various differentiations are made. From them

have been discovered important scientific aids in selecting superior, accelerated, normal, and feeble-minded individual behaviors. Differences have been brought to light concerning groups of people, sex, and race variations. They have been invaluable in vocational selection, student and employment guidance, and have proved their worth in the investigation of delinquents and criminals. Some tests are verbal, as in many of the tests of general intelligence, some are non-language and performance tests, but all of them justify their value, and indicate the importance of individual differences among people.

A Brief List of Useful Psychological Tests. To present a complete list of psychological tests is both unnecessary and impractical. It would necessitate an extensive booklet. The following list is given for the interested student.

I. VISION

Visual Acuity Tests:

THE SNELLEN CHART. (Sold by most optical supply houses.) This test is the well-known wall chart with rows of letters required to be read as indicated on the chart.

EWING CARDS. (Sold by C. V. Mosby Company, St. Louis, Mo.) These cards are used in the same way as the Snellen Chart. The set includes letters, pictorial characters, and broken lines arranged in various forms, arranged especially for children.

MCCALLIE VISION TESTS FOR ILLITERATES (and very young children). (Sold by C. H. Stoelting Company, Chicago, Ill.) The McCallie Test contains a set of ten cards, each card showing a picture of a boy, a girl, and a bear holding hoops in the air from an extended hand. In one loop there is a ball, shown as a dot. The subject is expected to say in what hoop the dot appears for the respective cards.

SNELLEN SYMBOL E CHART. (Sold by most optical houses.) The Snellen E Chart consists of the capital letter E placed in various positions, and the child is asked to point to the direction in which the prongs of the letter E appear to extend. It is designed, like the McCallie Test for children who cannot read the alphabet and for illiterate adults.

Other test instruments for variety and confirmation of the eye

examination are H. COHN'S E TEST, G. W. SEITZ TEST CARDS. Instructions for use are given on all the test materials.

Color Blindness Tests:

THE HOLMGREN WOOLENS. (Sold by most of the leading optical establishments.) The observer is handed the large green skein from these woolens and asked to select all the skeins that resemble its color. When the observer shows hesitation, or picks out a gray, a brown, or red skein as well as green, he is involved in probable color disability. Color-blind persons will often select blues and purples as matches, and even greens and grays.

THE NAGEL CARDS. (Sold by C. H. Stoelting Company, Chicago, Ill.) This test consists of two sections of a set of cards. The first, or A section, has sixteen cards, and the subject is asked to point to (1) cards with only red or reddish spots; (2) cards with red spots only; (3) cards with green spots only; (4) cards with gray spots only. In the second, or B section, one card is shown at intervals, and the colors seen are named. Color-blind persons will select in section A cards 1 and 2 with brown, yellow-brown as well as red spots. In cards 3 and 4 the color-blind confuse grays, greens, and reds. In the B cards color-blind persons usually see only one color on each card, red on B2 and B4, gray or green on B3. If B2 and B4 are seen as red or green, the person is definitely color-blind.

THE ISHIHARA TEST. (Sold by C. H. Stoelting Company, Chicago, Ill.) In its entirety this test consists of sixteen color plates in booklet form. The pages of the booklet are shown one at a time, and the numbers seen are called. Color-blind persons have difficulty in reading the colored numbers, and in some cases cannot read them at all. The opening pages of the booklet give the required responses for normal color vision, for the red-blind, the green-blind, and the totally color-blind.

II. AUDITORY RESPONSES

The best acuity test for auditory behavior is an audiometer such as is used in hospitals and by most ear specialists and all clinical psychology laboratories. When this instrument is not available, two other tests are valuable.

WHISPERED SPEECH TEST. This test is given in a sound-proof room. One ear is closed to hearing by using cotton, or a rubber stopper, and the uncovered ear tested. Often for improvised work the hand is used instead of a stopper. The person tested stands or sits with back to the examiner, and one ear is tested at a time, about forty-five feet distant. Very great care must be exercised in administering the whisper stimuli, and some practice may be necessary on the part of the examiner to gain adequate skill in pitching the whispered voice. A list of words and two-figured numbers should be prearranged in accordance with the needs of the testee. The Andrews' "Test-Numbers for Auditory Acuity," which follows, is frequently used and is very practicable. From it the investigator should select the specific stimuli, and the subject required to repeat the sounds heard or asked to write them on paper. In the case of both words and numbers, the results should be recorded accurately on the examiner's sheet.

TEST NUMBERS FOR AUDITORY ACUITY
(Whipple, after Andrews)

I	II	III	IV	V	VI	VII	VIII	IX	X
6	84	19	90	25	14	8	52	73	24
29	69	53	7	13	31	93	35	41	95
42	17	34	39	46	9	27	64	16	62
87	92	28	62	7	65	60	81	95	49
53	33	97	84	54	98	15	6	57	80
94	26	45	21	70	76	74	19	38	71
70	50	72	56	91	40	36	78	20	16
35	75	60	75	83	23	49	40	89	3
18	48	3	43	68	52	82	23	64	58
61	1	86	18	92	87	51	97	2	37

Reproduced from: Guy M. Whipple, *Manual of Mental and Physical Tests*, Warwick and York, Baltimore, 1914, p. 200.

WATCH TEST. The watch test has been popular for auditory measurement, but it is not as practical as the whisper test because of the difference in auditory stimuli. When used, a relatively cheap watch with a loud tick is most effective. The person tested is deprived temporarily of his own watch to avoid false reaction. He stands or sits with his back to the examiner with one ear closed, as in the

Whispered Speech Test. The watch is held in the palm of the examiner's hand, face forward, near the person's unstopped ear, and moved backward until he no longer hears the tick. The distance of the hearing reaction is then measured. A second trial is then given, moving the watch from a greater distance than the point at which the tick was previously heard, and moved forward toward the ear until the tick is barely audible, and the distance is again measured. Each ear should be tested five times, alternating the right and the left, and covering the face of the watch occasionally to avoid imaginary guessing. The score made will be the average for the five trials.

In careful examinations the two distances should coincide for the ear tested, and the method repeated for the second and untested ear.

III. MOTOR TESTS

Motor tests are used for the discovery of skills with their accompanying accuracies and precisions. They are useful in ascertaining many efficiencies. The following are both interesting and informative:

Steadiness Tests. Steadiness tests offer evidence of precision, show the control of muscular tremor, and are practical in many skills.

In psychological laboratories steadiness instruments are provided. Whipple's steadiness tester has been very popular and will serve the purpose of illustration. The subject is instructed to hold an electrically controlled stylus for 15 seconds in holes of different sizes that are cut into the apparatus, without touching the edges. The test determines the ability of the subject to inhibit the involuntary movements of the hand when it is not in motion.

If this instrument is not available, a fairly reliable substitute may be improvised. A simple practice is to take a sheet of paper on which are two parallel lines carefully drawn, the distance between the lines being about a quarter of an inch or less. The subject is instructed to draw a line between the parallels, not touching either of them. Precision and steadiness will appear from the accuracy of the work accomplished.

Finger Dexterity Test. One of a series of tests devised by J. O'Connor is called the O'CONNOR FINGER DEXTERITY TEST. It was

designed for use in vocational selection. The apparatus is simple and can easily be built. It consists of a tray containing 310 pins, and a board in which 100 holes have been drilled. The subject sitting before the board is required to place three pins in each of the 100 holes as rapidly as possible. The time taken to do the work accurately represents the score. Norms have been published covering the task. The test is worthwhile for ascertaining one's finger skills, coordinating eye and hand for speed and accuracy.

Tweezer Dexterity Test. This test was also designed by O'Connor. It is similar to the Finger Test in apparatus but in its method of procedure the subject is required to place one pin only in each hole using tweezers instead of fingers. The scoring is done in terms of time and accuracy. The test gives a good index for skill-readiness and may be carried out for either hand.

Motor Strength and Endurance. Strength of grip is measured by using the well-known Smedley dynamometer, which consists of a spring that registers the force of the human grip on a dial. Several trials are made by each hand and the strength of the grip is registered and recorded for each trial. Strength of the legs and back are measured by the use of a Back-and-Leg Dynamometer. The subject stands upon the foot rest and the examination for strength of back consists of lifting with maximum effort, using the back and arms without bending the knees. For testing the strength of the legs, the subject stands on the foot rest of the dynamometer and grasps the handle with the knees bent and body held erect, lifting with maximum effort and confining his task to the legs.

Substitute tests for strength evaluation may be made by using ordinary gymnasium bars and rings. In using the bars, the subject is instructed to lift his body by a push-up activity until his arms are straight. The rings, suspended from the ceiling, are grasped by the examinee in a pull-up fashion. Both types of responses should be engaged in until the subject is no longer able to accomplish the task during the prescribed intervals, and his reactions should be recorded to give a score for his motor strength.

IV. ATTENTION AND OBSERVATION

Observation. Material for observation-testing is given on pages 138 and 197 of this volume. The same material is useful for testing attention and concentration ability.

Attention. For testing attention, and even speed of movement, cancellation tests are used. The tests are made from capital or small letters, or digits, and one, two or more letters or digits are to be crossed out. The subject proceeds at his normal reading rate. Record is made of the time it takes to complete the test, noting omissions and errors. The test should contain about thirty lines with about forty letters per line, as in the following illustration:

ldevcbtqnwlxdrzfecgrpinajhxtqkyiwmucgolkebam
rtmhlciqagnyrtcljhinrbmqepglcsmrwxpcqztbaks

Complete tests may be secured from C. H. Stoelting Company, Chicago, under the name of Whipple, or Pyle's Cancellation Test.

It will be noted that if the instructions call for the crossing out of all c's in thirty lines of written letters, the task will yield some attention-errors.

Munsterberg's Attention Tests.⁵ In the following test the subject is asked to underline as rapidly as possible all groups of consecutive letters which make words, such as "eye" and "cat" in the first line. One-letter words, such as "a" are not underlined. Accurate time should be taken and a check made of errors or omissions, statistically computed when a group of individuals is tested.

TEST I

brloeyeldmpykecatholmpiwrbedxaumtirtmoxkcrytsoobm
ghdeipysirncedfkjhigyipekvtoklvneiillzcuyvnewoioupytm
gbhtarsxuefddogmkjiopynlidtopsdfhghotbrdenexerfisaeliey
urfrednjidrwasswygfwcanijkwcryyhwuyoumiofwtlipqhv
uglowquwcacekeardfiverwamgoiscexedluratmnmkliptonmap
mxefghuytlageblyfctiprijseapveruytwomibrylegquieyrcvsa
wtlxtenkrndigerstgtenvluyrcxfurrhy

⁵ H. S. Langfeld and Floyd H. Allport, *An Elementary Course in Experimental Psychology*, Houghton Mifflin Co., p. 196 ff.

In Test II, the successive pairs of figures which, when added, make a total of nine are to be underlined, for example, 81 54 90. As in Test I, the subject should proceed at his normal speed and the time used accurately noted. Omissions and mistakes are counted as errors.

TEST II

743256813756837453480964532167283625418628137705
 816435678069287354906238578932775931820825728135
 906823576328518737296365364517816320956725707665
 408618534927905832725630976536185670990765816356
 790365372385097294358260845667075276590236187134
 535736927378158236753286095318275280281395775398
 756326094537829607865346185077318268145463827612
 3546908435472865731

The average range of visual attention is four or five disconnected letters or numbers, six or ten letters in nonsense syllable arrangement, about four isolated words, and four to six short words in simple sentences. This observation will give some idea of what we may expect in average adult testing.

Similar tests may be arranged with misspelled words which are required to be underscored, as in the following illustration :

Attention is not a seperate pychological process supurim-
posed upon sense-perception, but a factor within the per-
ceptualising process itself and characteristic of memory,
 imagination, and thinking.

V. PERCEPTION, INCLUDING OBSERVATION AND ATTENTION

1. What is the first pattern you see in the following picture?
2. Look at the picture for half a minute and name as many military factors as observed.
3. What forms the eye of the picture?
4. What forms the lower lip of the picture?
5. What forms the chin?
6. What forms the ear?

7. What insignia lies on the chest? Did you notice these objects when you answered question 2?

VI. LEARNING

The tests of learning are numerous. There are tests of motor learning, ideational learning—tests that require results on the formation of associations or connections among words, numbers, commonly called “ideas.” There are tests of sensory-motor learning ascertaining the speed and precision of performance in sense perception. Since learning involves the systematic linking of ideas or movements, tests should conform as nearly as possible to everyday-life situations. Psychologists have therefore contrived tests that at first sight seem to be unusual, if not peculiar. For sensory-motor learning testing material consists of maze problems, mirror drawing, card sorting. For ideational learning substitute tests are used. This means substituting sets of letters, numbers, symbols for another set of symbols. As ideational learning proceeds, tests of association, of perception-span, and of memory are common.

Sensory-motor Tests. These are used for testing speed, precision, and movement in sense perception.

CARD SORTING. This is used to test sensory-motor discrimination and visual perception.

A sorting box is provided with compartments marked to agree with cards to be sorted, the cards being thirty to fifty in number. The score is computed from the seconds required to complete the task, subtracting the errors of placing cards in the wrong compartments. The sorting box with cards to match is made up as follows:

23	29	18	35	15
34	11	29	17	24
26	12	30	28	13
14	31	22	33	27

VII. MEMORY

Lists of fifty disconnected words are prepared, and one is used for each test.

Visual Recall. The subject is given one of the lists and told to study the words carefully for one minute. At the end of this time, the sheet is taken from him and he is asked to write down as many words as he can remember.

Auditory Recall. A second list of words is now read slowly to the subject, allowing about one second per word with a two-second interval between the words. Immediately after the words have been presented the subject is asked to write down all the words he can remember.

A good practice is to make a list of words from a scientific text book. It will offer a learning aid that might not otherwise be done systematically.

Visual Recognition. One of the lists used on a previous day is again shown the subject with an added list of twenty-five words that he has not seen before. He is asked to check all the words that he has seen previously.

Auditory Recognition. In this kind of test the subject is told to prepare a record sheet containing spaces numbered one to seventy-five. One of the lists of fifty words and a new list of twenty-five words is read to him. As each word is read the subject writes "Y" for "yes" if he recognizes having heard the word before, and "N" for "no" if not previously heard. If in doubt he should leave the space blank.

Logical Memory (for ideas or meanings). In tests for logical memory, the subject is required to reproduce the thoughts or ideas of a piece of prose. It may be read to him or he may read it himself. A popular test is Whipple's "Marble Statue" which follows:

THE MARBLE STATUE *

A young / man / worked / years / to carve / a white /
marble / statue / of a beautiful / girl. / She grew prettier / day
by day. / He began to love the statue / so well that / one day /

* G. M. Whipple, *Manual of Mental and Physical Tests*, Part II, Warwick and York, Baltimore, 1915.

he said to it: / "I would give / everything / in the world / if you would be alive / and be my wife." / Just then, the clock struck / twelve, / and the cold / stone began to grow warm, / the cheeks red, / the hair brown, / the lips to move. / She stepped down, / and he had his wish. / They lived happily / together / for years, / and three / beautiful / children were born. / One day / he was very tired, / and grew / so angry, / without cause, / that he struck her. / She wept, / kissed / each child, / and her husband, / stepped back / upon the pedestal, / and slowly / grew cold, / pale / and stiff, / closed her eyes, / and when the clock / struck / midnight / she was a statue / of pure / white / marble / as she had been / years before, / and could not hear / the sobs / of her husband / and children.

Age and sex norms have been published for this test by W. H. Pyle for written reproduction. It shows the scores for the number of *ideas* reproduced correctly.

NORMS FOR "MARBLE STATUE" INDICATING NUMBER OF IDEAS REPRODUCED *

Boys												
Age	8	9	10	11	12	13	14	15	16	17	18	Ad
No	102	148	142	149	156	163	129	89	60	45	32	65
Norm	24 3	28 7	30 0	32 9	35 1	36 8	36 1	36 5	34 4	34 6	36 9	38 3
Av dev	6 7	9 1	6 7	5 6	7 4	6 3	7 0	6 7	5 6	8 7	6 0	7 0
Girls												
Age	8	9	10	11	12	13	14	15	16	17	18	Ad
No	89	158	138	156	191	164	146	99	94	81	48	86
Norm	28 5	31 0	33 5	36 4	38 1	38 5	39 0	39 1	37 3	36 6	37 8	40 1
Av dev	11 3	9 4	6 8	7 7	7 2	7 1	7 5	6 3	5 1	6 9	4 4	5 9

* Harry E. Garrett and M. R. Schneck *Psychological Tests Methods and Results* Harper & Brothers New York, 1933, p. 130. Reproduced by permission.
See Bronner, Healy, Lowe, Shimberg, *A Manual of Individual Mental Tests and Testing*, Chapter 4, for Auditory Verbal Memory Test, Aussage Test, Card Sorting Test, Cube Imitation Test, Digit Memory Span Test, etc., for additional tests on memory and learning.

VIII. EMOTIONS

Emotional Maturity. To discover emotional maturity, as shown by an individual's willingness to accept responsibility, and to indicate his freedom from childishness, the *Emotional Maturity Scale*, by R. R. Willoughby, published by the Stanford University Press, is valuable. The test is designed for college students and adults. It contains sixty items representing a type of situation and a reaction to it, such as "S is serious and anxious in his manner, even in cases where nothing important can hang on the results." Statements of this kind are checked by the person taking the test and he is asked if it describes him, or if it describes the individual he may be evaluating.

Facial Expression. Since an individual's emotions are frequently expressed in the face, the accompanying picture, Fig. 50, will be interesting. Look at each face quickly, cover the emotion named, then write down on a sheet of paper the emotion that it presents to you. In a second trial take plenty of time, note the face carefully, and record your reactions. Do your two lists agree in emotional description?

IX. NURSE'S APTITUDE TESTS

For measuring the competency of nurses, the following test is valuable: "A Measuring Scale for General Staff Nurses," by M. R. Barnes and D. H. Chapman. (*American Journal of Nursing*, 1943, pp. 377-382.)

A description of the need, differentiation, and program of the Cadet Nurses Corps has been offered by R. L. McManus, under the title of "Vocational Counselling in Relation to Nursing." (*Teachers College Record*, 1944, Number 45, pp. 532-542.)

A critical article, entitled "Personality Test Scores and Success in the Field of Nursing," has been written by C. K. Bennett and H. P. Gordon. (*Journal of Applied Psychology*, 1944, Number 28, pp. 267-268.)

X. INTELLIGENCE

There are numerous tests of general intelligence. The references that follow are illustrative, and the tests may be used to advantage.

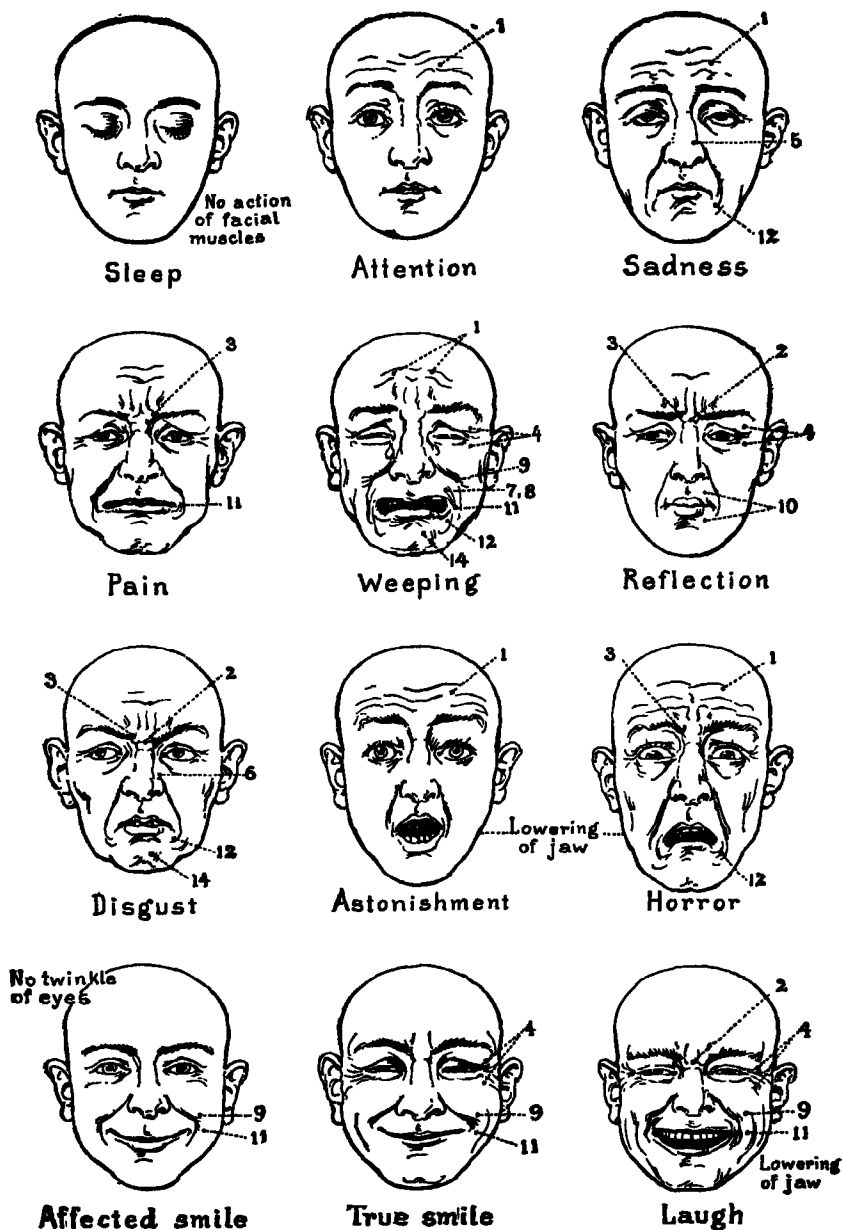


FIG. 50. Muscles of expression in action. (Moore, T. V.: Dynamic Psychology, 2nd Ed.)

Verbal Tests of General Intelligence. Probably the most widely used verbal Intelligence Test is the "Terman Group Test of Mental Ability, Forms A and B," by L. M. Terman. (Published by the World Book Company, Yonkers, New York.) This general test covers the range from childhood to adolescence. Forms A and B contain ten tests dealing with (1) information; (2) best answer; (3) word meaning; (4) logical selection; (5) arithmetic problems; (6) sentence meaning; (7) analogies; (8) mixed sentences; (9) classification; (10) number series. The forms are especially designed for children in grades 7 to 12, corresponding to junior and senior high schools.

Individual intelligence tests are largely patterned on the Binet-Simon method brought out in France from 1905 to 1911. American adaptations and revisions have been frequent. The Terman and Merrill "New Revised Stanford-Binet Tests of Intelligence" (1937) is the best known and most widely used individual test of general intelligence in America today.

The CAVD Intelligence Scale. This scale was produced by E. L. Thorndike (see: *The Measurement of Intelligence*, Bureau of Publications, Teachers College, Columbia University, 1927). The test contains tasks involving the completion of sentences, carrying the symbol C. Arithmetic problems are represented by A, vocabulary by V, and directions by D. The range of difficulty is designated A to Q. At the A level 50 per cent of the total of forty items can be solved by an individual with a Mental Age (MA) of three years, to the composite level Q where 50 per cent of the total items can be solved by only 20 per cent of college graduates. Throughout the test there are seventeen levels of difficulty, with each level having a numerical difficulty value.

Performance or Non-language Tests. Verbal tests are called abstract because they seek to measure school ability. In contrast, performance tests use a minimum of spoken or written language. The means of evaluation are pictures, form-boards, blocks, and similar stimuli that show ability in sensory-motor learning. They require the individual to do something rather than say something. A good sample of the non-language tests for adults is the "Army Beta Intelligence Examination," originally published in 1918 for use with American soldiers in the First World War. The test consists of maze drawing, cube analysis, X-O's in sequences, digit-symbol, number check-

ing, picture completion, and geometric construction. Directions are given by gesture, pantomime, and by demonstration board because of the examinee's inability to read, write, or speak the English language.

The significance of performance testing for young children in their preschool and early school years is well illustrated by the "Pintner-Cunningham Primary Mental Test," prepared by R. Pintner and B. Cunningham. (Published by the World Book Company, Yonkers, New York, 1923.) The test measuring Kindergarten and the first and second grades of school children, makes use of non-verbal material which shows ability in (1) common observation; (2) aesthetic judgment; (3) association of objects; (4) discrimination of size; (5) picture parts or picture completion; and (7) dot drawings.

For further illustrations of this important matter of intelligence the reader is referred to any of the following excellent manuals:

BUROS, O. K. (Ed.), *The 1940 Mental Measurements Yearbook*. Highland Park, N. J.: The Mental Measurements Yearbook, 1940.

BRONNER, HEALY, LOWE, and SHIMBERG, *A Manual of Individual Mental Tests and Testing*, Boston: Little, Brown and Company, 1938.

GREENE, JORGENSEN, and GERBERICH, *Measurement and Evaluation in the Secondary School*, New York: Longmans, Green and Company, 1943.

H. A. GREENE and A. JORGENSEN, *The Use and Interpretation of Elementary School Tests*, New York: Longmans, Green and Company, 1935.

EDWARD B. GREENE, *Measurements of Human Behavior*, New York: The Odyssey Press, Inc., 1941.

HORST, P., *The Prediction of Personal Adjustment*, New York: Social Science Research Council, Bull. No. 48, 1941. (For Advanced Students)

HUNT, THELMA, *Measurement in Psychology*. New York: Prentice-Hall, Inc., 1936.

XI. READING

Reading tests range from the earliest primary grade readings to the adult years. For testing the reading ability of college students and others of similar years the following are useful:

- (1) *The Monroe Silent Reading Tests (Revised)*. Test III, designed for high school pupils. If a student passes this test he should succeed in tasks involving reading in his college courses.
- (2) *The Whipple High School and College Reading Tests*.
- (3) *The Iowa Silent Reading Tests*. Revised. Advanced Series.
- (4) *Nelson-Denny Reading Test*. Vocabulary and Paragraph. Form A. Houghton.
- (5) *SRA Reading Record*. Science Research Associates, 228 So. Wabash Avenue, Chicago, Ill.

There are tests in the various divisions of the English language, foreign languages, mathematics, science, social studies, and history. Apart from testing his own ability by having the tests properly administered and scored, a knowledge of this form of psychological diagnostics is useful to any student in obtaining information concerning children's normality or deviations from normality, when such situations fall within his care in special situations. Although he may not be called upon, nor be expected to do this type of work, a knowledge of psychometric testing is always valuable.

For a complete discussion on essential reading skills, measurement of reading abilities, remedial and corrective work in reading consult the manual *Measurement and Evaluation in the Secondary School* by H. A. Greene, Albert N. Jorgensen, and J. R. Gerberich, Chapter XV; and J. E. Bentley, *Problem Children*, Chapter XVII, Reading Disabilities.

ORIENTATION

Since the nurse in her training is brought face to face with abnormal human behavior, in hospitals for the mentally sick, and that in her courses in psychiatric therapies psychoanalytic terminology is used, it seems desirable to present a survey of psychoanalysis. The following pages sketch the basic work of Freud, Adler, and Jung. They seek to supply an historic statement of fundamental principles, offered in an introductory manner.

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Psychoanalysis

Psychoanalysis is a dynamic system of adjustment psychology based on the method of free-association. It was first used by Wundt, the founder of modern psychology, in the interests of normal sensory reactions, and extended by Kraepelin to the investigation of abnormal states. Psychoanalysis is not distinguished for its logical consistency, nor for its adherence to strict scientific method. Precise measurement and rigidly controlled experiment are almost impossible in its procedure, which is particularized by personal and autobiographical means. Its devotees have, however, developed an intense faith in it—a faith opposed bitterly by its adversaries. American scientific psychology does not look upon it with much favor although it is used as a therapy in adjustment literature where its terminology is relatively common.

Originated by Sigmund Freud, with his concept of the unconscious, psychoanalysis has developed an elaborate technique which has been utilized by many clinicians in the study of nervous and mental disorders. Its three famous apostles are Freud, who was its founder, Adler, and Jung. Their theories and those of their followers rightfully belong to the field of abnormal psychology, sometimes called medical psychology, where they have proved useful in the study of disintegrated personalities. Freud, and his successors, are in the direct lineage of the classical alienists—Pinel, the French founder of the application of scientific methods to insanity; Kraepelin, the eminent German who integrated insanity with physiologic symptoms; and Charcot, the French authority of the earlier theories of hypnosis and hysteria.

SIGMUND FREUD AND METAPSYCHOLOGY

Freudian psychology, widely popular and notoriously interpreted, is largely the product of undirected design. It was born in the medical practice of Freud, and his senior partner Josef Breuer, in Vienna, about the time Wundt was developing early scientific psychology. Breuer and Freud were baffled by the case of a twenty-one-year-old girl who was paralyzed on the right side of her body, and who squinted and hiccupped in a marked manner. Her speech would disappear, hallucinations were frequent and grotesque, her emotions ranged quickly from extreme sadness to extreme excitement. She was presumably another of the puzzling cases of hysteria. Freud, as a pupil of Charcot in Paris, had witnessed the work of Leibault and Bernheim in the famous institution for nervous diseases at Nancy, France. Many remarkable demonstrations were occurring through the method of inducing hypnotic sleep. Accordingly, Freud hypnotized his patient, who, on waking, was asked to recall something from her slumber. At first memory was blank, but with persistent effort shreds of thought appeared, and finally full recollection. Then the patient gave evidence of knowledge unknown in her previous conscious state. She was now recalling her forgotten childhood's history to the astonishment of her physicians, and when the origins of the physical and mental symptoms were brought one by one to her unconscious memory and her childhood's emotions repeated, her ailments disappeared and her health was restored. From such cases of nervous trouble was born the concept of the unconscious.

The many factors in this girl's illness, after repeated examinations and discoveries, led Freud, in collaboration with Breuer, to offer the epoch-making article: "Concerning the Psychic Mechanisms of Hysterical Phenomena" (1893), followed by a volume entitled *Studies in Hysteria* (1895). Here was laid the formula: to understand hysterical patients it is necessary to trace the symptoms into the realm of the unconscious and find there the forces that produced them. It was discovered that when the buried memories were brought to consciousness the various symptoms of physical and mental ills would disappear.

Freudian Motivations. Freudian psychology seeks the motives of the psyche in the primal drives deep in human nature. These drives are chemical energies in the biologic organism transformed into mental energy manifested in instincts, "urges" seeking satisfaction appropriate to their nature. Satisfactions produce pleasure, being governed by the "pleasure-principle," dissatisfactions produce pain. The unconscious drives and urges are varied but they represent two basic instinctive impulsions known as Eros and Death. The Eros or libido, is the dominant primary urge of life, the sex-urge, and is a constructive, creative force. The Death, or destructive urge, is expressed in inertia and compels disintegration. These two propulsions—libido and disintegration, are in constant tension and represent the two polarities of life's continuous conflict.

THE UNCONSCIOUS IS THE REAL DYNAMIC SELF

When Freud was beginning his laborious medical practice academic psychology appeared to him to be hopelessly sterile. The description of sensory parts, sensations, segregated images, feelings, were irritating to his sympathies, and out of all relationship to his needs. He wanted to know how the various parts of the psychic life, the tendencies of the conscious mind, the impulses, instincts, and desires of human nature, affected the individual. He wanted to know how the individual is constructed into a being of conscious and unconscious components. Then he planned the journey into the human depths, surveying it in every possible particular, and in so doing discovered to his own satisfaction that the unconscious is the real self of man, and the controlling medium of his conduct. It begins in pre-natal life, consists of strivings in their fused and contradictory gratifications, and remains indestructible as a substance of heredity. Hence the unconscious is the depository of an individual's racial and individual experiences. It is powerfully dynamic, violently active, self-centered, and controlling. It is this primitive self which harbors the diabolisms of the racial past, a devil reincarnated in man, plotting, scheming, revenging, brutal, but capable of constructive regeneration.

This crude unconscious self knows no morals, no law; it becomes the storehouse of repressed wishes which constitutes a veritable

psychic hell. From this mad, brutal self, man must extricate himself, tame his unconscious mind, or the warring wishes will run amuck in human living. His ruthless impulses must be curbed, redirected into ways of order, or they will destroy him; he must obey the demands imposed upon him by normal society, hear the dictates of morality and so adjust himself to normal life. His instincts, urges, drives must be woven into constellations—unrepressed emotional ideas, appropriate to the world of reality, regenerated by the libido and directed into new channels by seeking new objectives. There must be no pent-up energy in the conscious mind, for like a stream it must flow. If the stream is obstructed eddies form and rush turbulently into dangers which compel suffering. The stream must be clear, freed from debasing mud, then (from this analogy) the mind conforms to what Freud calls the "reality principle," which is necessary for the proper ordering of life and the control of the demands of the "pleasure principle." This transformation of the ego is achieved through ethical and social considerations whereby the organism adapts itself to the exigencies of reality. Thus it is that civilization survives through education, law, religion, and kindred cultures. What happens if the unconscious emotions are in part or entirely repressed; the mud that persistently refuses to be removed from the water of the stream that should be clear? These segments of the libido, undirected into normal channels of living become repressions, or complexes as Jung later named them.

THE THEORY OF THE COMPLEX

Repressions, for Freud, are perceptions or ideas which are forced into the unconscious system because they would be painful if aired in conscious life. They are rejected by the ego but remain dynamic, being "bottled" in the unconscious because of little or no outlet for expression, yet they remain intensely active in their submerged mud-bed. Countless factors contribute to this unhealthy storage: faulty training, undue restrictions, excessive narrowness to life and morals, unpleasant experiences, mostly associated with childhood days. Natural expressiveness having been denied, freedom of action blocked, inhibit the psychic forces of the unconscious, and the complex is in the making. When the condition becomes too strong then the indi-

vidual is in danger of "blowing up," hence it is the function of the complex to defend the ego from pain and danger. Nevertheless, in such a situation, the complex is prohibited from showing its real self because a force is said to be at work, called the censor—the inhibitive mechanism, the conscious mind trained to conventional thinking—forbids its appearance. The complex, however, refuses to be silenced because of tension between the conscious and unconscious systems. It endeavors to assert its activity through what the Freudians call *disguise*, shown in peculiar alterations of conduct.

Fundamental to all human interests is the libido or eros, which is the force behind all life. It includes the highest aspects of the human mind—its friendships, its devotion to worthy purposes, its intellectual aspirations, as well as the sensuous expressions of love. When, however, the lower libidinal forms become engrossed in unrefined impulses then the complex becomes pathologic and perverse. Its milder activities are seen in frustrations, and the foiling of love in "family complexes" expressed in various forms. Childhood is expected to offer a means of escape from this unfortunate direction by adequate socialization, play, proper training, and adjustment in school and home.

But how are the complexes penetrated and brought to the surface for adjustment? Freud, at first, relied on the method of hypnosis but became afraid of inadvertent suggestions, and thereupon resorted to the process of allowing the patient to talk freely and fully. Meantime he remained alert to detect any topic which the patient might approach repeatedly and each time quickly evade. This conscious co-operation of the patient led Freud to develop the method of transference whereby the patient produced an emotional attitude of respect for the physician-analyst, unburdened himself, and permitted deeper inquiry. When the patient discovered what was wrong with himself, aided by the analyst, the case was ready for adjustment through a restoration program.

THE DYNAMICS OF THE HUMAN MIND—DEFENSE MECHANISMS

- ✓ Because of the changing demands of the outer world the Ego (psyche) is required to maintain a balance between the unconscious, the Id or deepest part of the unconscious mind, and the Super-ego,

the critical monitor of the Ego which produces anxiety or distress, akin to conscience in the moral sense. The countless behavior patterns of even the normal person are always in danger of becoming exaggerated to the point of directing behavior into abnormality, to which human criticism may turn. To meet this besetment there are behavior patterns in the Ego which act as defense mechanisms against undue upset. They are processes which set up substitute channels for the discharge of the libido inhibiting its activity by seeking to preserve its integrity by what Freud calls "dynamic formations." These dynamisms of the human mind, or defense mechanisms, are substitute forms of satisfaction providing a defense against over-repression and undue suffering to the human being. Man is essentially a pleasure-seeker and shuns pain, therefore he must overcome the damming-up of energy and relieve any complex by the transfer of the effect from one idea to another. He must take himself out of the trivial effect and seek a better, a more socially acceptable or less-repressed, effect; this mechanism is called the dynamism of displacement.

Many such mechanisms have been distinguished, the most important being repression and transference. Repressions inhibit the memory of unpleasant events, forcing it out of consciousness into the unconscious, in order to forget. Transference brings the patient into an attitude of affection and unmitigated trust toward the physician-analyst; without it no therapy is possible. Two other dynamisms of the mind that are important are rationalization and projection.

- ✓ Rationalization is a form of defense in which the individual endeavors to give socially acceptable reasons for his behavior. It operates in making excuses for conduct, in explaining away inferiorities, and is really irrationalization since it covers up the real and ugly motives by making them appear in attractive form. The "sour grapes" behavior is a common form of rationalization (see page 273), as is also its opposite "sweet lemon" fatalisms.

Projection is a form of defense allied to rationalization. By it disagreeable and unpleasant factors are projected and centered on others, as when one passes on to another a disagreeable task. Moreover, persons who see dishonesty everywhere project; they pass on their foibles to the many and invest them with probable erroneous character. But projection may be positive being manifested in the

manner in which one interprets his own powers and wishes in a sort of glorified egoism.

Other dynamisms, or defense mechanisms, in the Freudian system are:

Idealization, which Freud calls "sexual overestimation," as shown toward the object of respect or love, endowing the love-object with every excellence and subordinating the Ego to it, like the exalted love of a Dante for a Beatrice.

Conversion transforms repressed and disagreeable impulses and gives relief through bodily expressions or "symptoms," such as tics, hysterical blindness, paralysis.

Isolation expresses itself in obsessive ceremonials, treating a pain or a disease as if it did not exist, a compulsion neurosis is characteristic.

Introjection, the reverse of projection, is shown in the tendency to absorb the personality of others into one's own psyche or Ego, producing an identification of one's self with other persons or objects. When identifications are too numerous there is a danger of developing the multiple personality.

Phantasy is a dynamism which expresses urges and desires in undue imagination, such as daydreaming where one wanders away from reality and indulges in pleasing imagery.

Fixation represents an excessive attachment of the libido to some other person or object lessening its freedom in dealing with reality and predisposing the individual to abnormal behavior.

Condensation fuses experiences or ideas in the unconscious and manifests itself in dreams. In this dynamism a particular idea is considered to be derived from other and several ideas, hence the manifestation is condensed.

Symbolization is an important factor in dreams. By it the emotion is shifted from the repressed object to another unconsciously recognized as similar, condensed and figurative. The manifestation appears also in witty statements, puns, and myths.

Sublimation is a refining of impulses. Freud uses it in two ways: (1) in the civilizing of man's instinctive impulses, desexualizing them, and directing their energies into new channels with new objectives, such as sports, social welfare, religion. In this manner the rough,

crude, and barbarous impulses of man's nature are refined and brought into social subjection. (2) But there are tensions that should be wholly inhibited, tensions built into the unconscious which if not rebuilt may result in neurotic behavior, and possibly nervous breakdown. In this case a change of object is essential, such as a change of occupation, a change of belief as in religion, a sublimation of the material instincts in which thwartings are replaced by service to humanity, such as activities in social service, teaching children, and similar generous services in human conduct. The strong instinctive foundation in such individuals is redirected to beneficial and satisfying objectives.

DREAMS

The primary avenue for the Freudian approach to the unconscious is the analysis of dreams; other subsidiary channels are the so-called functional errors, such as the forgetting of names or tasks, mistakes in writing, reading, and speaking, misplacing objects, slips of the tongue, all of which are said to be expressions of repressed intentions. Freud's treatment of the problem of dreams is fully written in his books: *Concerning Dreams* (1901) and *The Interpretation of Dreams* (1900); for the functional errors he has given a comprehensive treatise entitled: *The Psychopathology of Everyday Life* (1901).

Unconscious mental activities come to light through the analysis of dreams, according to the Freudian system. In them repressed wishes are released in order that they may disguise gratification. Original urges within the depths of the unconscious are censored, and for this reason what we know in the waking hours of a dream is a distortion, involving the dynamisms or mechanisms of dramatization, symbolization, condensation, and displacement. That part of the dream actually remembered is called the manifest dream-content representing a series of associations disguising the real meaning. It is this dream-content that must be explored in order that the real, unconscious desires, called the dream's latent content may be analyzed. Nothing in the dream is meaningless, and every item counts.

ALFRED ADLER AND INDIVIDUAL PSYCHOLOGY

Psychoanalysis did not remain the private conviction of Freud, its founder, but became an international sensation. In 1906 the Freudian system passed into Switzerland and influenced the psychiatric interests of E. Bleuler and C. G. Jung. It found eager sympathizers in America, claiming varied devotees: psychologists, journalists, playwrights. Stanley Hall popularized Freud; McDougall was exuberant in his praise for Freud's contributions; J. B. Watson declared Freud's teachings stimulated the thinking of psychologists and psychiatrists alike; William A. White carried Freudianism into extensive clinical practice at the St. Elizabeth's Hospital in the national capital.

Psychoanalytical theories invaded the fiction of Eugene O'Neill in: *Mourning Becomes Electra*, of Philip Barry's: *Tomorrow and Tomorrow*, of Philip Gibbs: *Hidden City*, to mention a mere beginning in fictional literature. In Europe, Pfister and Bernfeld carried the psychoanalytic doctrine to education. Rank, Pfister, and Reik, and many others applied it to religion and mythology. Alfred Adler, a brilliant pupil of Freud, departed from orthodox Freudianism, and offered a competitive system designated "individual psychology."

Alfred Adler was an Austrian psychoanalyst who held that behavior is dominated by the drive for power. His first important work: *Studies in the Inferiorities of Organs* (1907) developed the concept of overcompensation, or the tendency to exaggerate a trait by excessive activity of some kind in order to overcome an inferiority. He was falling away from Freud as his volume *The Neurotic Character* (1913) abundantly testifies. When the systematization of his views appeared in his famous volume: *Understanding Human Nature* (1927) it was clear that the metapsychology of Freud was abhorrent to him, and individual psychology became a new movement almost in its own right. Adler makes but little use of analysis and none of transference, and refuses to concede the vital importance of sex in mental disorder.

THE DRIVE FOR POWER

According to Adler, the principal force of life is a drive for power, a striving for superiority and self-assertion. Frustration of this drive

leads to the development of inferiority, the inferiority complex. His therapy is described in: *The Practice and Theory of Individual Psychology* (1924), in which he prescribes methods for overcoming difficulties and achieving the feeling of superiority.

Revolting from Freud's conception of sex-motivated human nature, he does employ many of the Freudian mechanisms of conduct but gives them new meanings. With the unconscious he has no concern, and the libido does not take a place of importance in his system. Psychology, for Adler, is an interpretation of the interaction of the individual with society. In normal individuals conduct is an adjustment to reality and integrated with social drives, the one outstanding impulse being the desire to feel important—the drive for power. This urge is the one exclusive aim of human nature, the one compelling force. It develops after birth and is guided toward goals in life by the prevailing pressures of the environment.

Individual Psychology. The chief principle of the individual psychology of Adler is the inherent purposiveness of human personality grounded on biological, social, and rational tendencies. He contends that the love of self is universal, built on biologic purposiveness in the innate reflexes and emotions which seek the preservation of the organism. This biologic setting is motivated by a social purposiveness culled from contact with communal affairs and events, and called **social feelings**. The biologic and social tendencies contrive to plan the activity of the individual with conscious, rational purposes. Life is therefore a motivated totality, an inherently purposive unity. At once it will be seen that the Adlerian system, much simpler than the Freudian, is more logical and more plausible. Thus, every activity of the personality, normal and abnormal alike, must be understood in terms of the purposive structure of the individual within his environmental bonds, but its consciousness must be probed for hidden motives. Adler's dynamic units or defense mechanisms are physical and emotional "inferiorities," compensations for such inferiorities, purposes, life-plans, goals, and social feeling or the "feeling of community." Personality, conduct, normal and neurotic alike, proceed from the interplay of these dynamic units functioning in the individual's relation to his environment.

The Place of Childhood. Adler, like Freud, develops his psychology by going back to the period of childhood in the attempt to under-

stand the individual. The love of power, he maintains, is evident from the beginning of life where the quest for power is incipient. Children are ruthless for power; their consciousness of themselves make them selfish, self-important egos. Their love of control is rooted deep in their nature and their love of self is inevitable. But this drive is not instinctive, as one might suppose. Adler is not an hereditarian for he regards this urge for power to be a post-natal adjustment due to conflicts between the individual and his social world. In some manner the child has been belittled, his sense of importance has been insulted, his ego abused. Somewhere and somehow the child has been forcibly pushed aside, his individuality discounted. In his earlier works Adler disclosed this love of power to be dependent on organic inferiority; in his more mature thinking, presented in the volume *Understanding Human Nature*, he inclines to the view that the love of power emanates by accident in human society. In any case the craving for power begins early in life and constitutes the groundwork for adult behavior, with its mad race of one individual seeking to excel others.

The child's sense of dependence, his consciousness of being weaker than someone else, his relegation to the side-lines, cooperate in producing a feeling of inferiority from which he seeks to escape by compensatory means. This phenomena accounts for the success of many famous men, who, despite their organic inferiority, such as unusualness of physical stature, have sought and succeeded in overcoming their defect by compensation in talents and character. Thus a Beethoven overcomes defective hearing and excels in music, a Napoleon overcomes a tantalizing smallness inviting ridicule and excels in military leadership, and many mediocre intelligences command a place of superiority in terms of physical and social graces in common life.

SOCIAL FEELING

Second to the fundamental striving for prestige is the development of social feeling. Man is a social animal. He cannot run away from the world without inviting displeasure and doom. Granting that man's first motive is the struggle for power, social feeling plays a contributory role in the accomplishment of character. To be useful

and helpful to mankind, to do your duty gladly is incumbent on all men in the tasks of daily living. Hence active responsibility, loyalty to people, love of fellow men, adherence to truth, impel happiness and satisfaction and create perfect adaptability in human living. Accordingly, man must encourage and develop his social feeling in order to overcome any sense of inadequacy. It is his defense in a world that demands social adaptability, for sooner or later conflict will appear and he must face its issues. But, if his inferiority has got the better of him, what else can he do but stay away from reality, set up fictitious goals, and eventually disintegrate. Social feeling is very important and must be respected and developed, for every failure however trivial and innocent brings its measure of punishment. The search for power in every ruthless and exaggerated form degrades social feeling which demands man's continual adaptability to human society at three imperative relationships: (1) in his friendships, (2) in his sex-life, and (3) in his profession. Failure in any one of these relationships is intolerable and the cause of subterfuges; their successes, conversely, build a life-line which achieves worthy goals and balanced behavior.

DREAMS AND THE UNCONSCIOUS

Refusing the Freudian interpretation of dream phenomena with its sex-strivings, its incestuous motivation, Adler looks upon the dream as an expression of individual desires. Its images are symbols, similes or analogies, reduced to simplest terms and representative of the daily life of the dreamer, relaying the attitudes of daily habits that filter into the sleeping hours.

The unconscious, like dreams, is drawn from the daily life of the individual. It is a hidden and concealed aspect of human life. Man's striving for power must necessarily be unrevealed, and his life-plan thought of in highest terms, which is man's private mental property and therefore unconscious. If this power and life-plan are pursued in conformity with social feeling both consciousness and unconsciousness are apparently normal; if social feeling is defiled, then the unconscious fails to achieve its purpose, and antagonism to man and society results with corresponding mental defects.

C. G. JUNG AND ANALYTICAL PSYCHOLOGY

Carl Gustav Jung, the Swiss psychiatrist, stirred by an intense love of humanity, and with unusual humanitarian motives derived from the study of medicine, offers an attractive but difficult analytical psychology. In a sentence he stresses the role of racial memories buried in the unconscious as the determinants of behavior both normal and otherwise. Thousands of men and women have been drawn to the door of this dynamic prophet of psychoanalysis in Zurich. Dissenting from Freudianism, and tending in a direction from the individual psychology of Adler, Jung prefers to recognize the positive aspects of mind. He refuses to believe that man is made up of repressions, and has little desire to probe into the ugly mud of life's mental stream. His preference is to view the undeveloped and promising aspects of mind.

THEORY OF PSYCHIC ENERGY

Freud's conception of the libido is entirely sexual. Adler conceives the libido to be a striving for power. Jung in contrast with both of his illustrious contemporaries regards the libido as a state of adaptation, a general life urge from whence springs all activity and all striving. It is the entire stream of psychic energy, of which the sexual is only a part, and includes the moral nature of man. Its movement is a flow between two opposites—the unconscious and the conscious, one gaining what the other loses. The unconscious is the reservoir of racial and ancestral memories which contains within itself the moral and religious principle. It holds the mental life of the race and is a kind of racial soul upon which we build our lives. It is the matrix from which desires and demands take definite form. This content, with its individual and racial experiences, its rhythm of constellations related to earth and sun, and the goals of the libidinal instinctive drives, possess forms which the mystics contemplate, and for which the schizophrenics turn inward. It consists of reason, feeling, unthought-out impressions, and insight into things. It is an activity which is both impulsive and creative, springing from the roots of life, provided for the individual at birth in the nature of undeveloped feeling, thinking, ability, and activity.

This unfolding of life, beginning with birth, represents the libido in its primitive aspects moving and halting in life's journey. It appears in childhood as a pre-sexual stage when all goals are nutritional, but the libido moves onward until the age of puberty when it tends to mature, widening its range when beset with struggle. Its movement is **progression**, its stoppage is **regression**, its critical struggle **transformation and symbolism**, its inward direction **introversion**, its outward movement **extroversion**.

Jung very early developed an interest in mythology and mythological thought. Accordingly he distinguished two kinds of thinking: (1) **directed thinking**, and (2) **dreaming and phantasy**. Directed thinking is represented as inexhaustive communication which adapts itself to reality. Dreaming and phantasy turn away from reality, liberate subjective wishes and fail to adapt the individual to his world, reverting him to some form of "childish passion for rational enlightenment." Dreaming is "myth phantasy," a return to the early phylogenetic stages of thinking, broadly symbolic and wider than the sexual interpretation of the Freudians. Phantasies therefore indicate an ineffective adaptation to life and serve to compensate for the inadequacy of adjustment due to imperfect libidinal attachment to reality.

THE UNCONSCIOUS

The unconscious, in Jung's interpretation, differs considerably from the Freudians. It is not entirely base and animal since it contains within itself the moral and religious principle, and the positive direction of mental energy. Jung therefore broadens the conception of the libido, extending it beyond the limits of Freudian connotations. It was this reinterpretation that caused the rift between Jung and Freud, although Freud later accepted it in part in his hypothesis of the unconscious Super-ego. Jung invests the unconscious in two ways, giving it two important parts (1) the individual unconscious, and (2) the collective unconscious. The individual unconscious consists of repressed personal experiences, occasioned by imbalance in the total psychic life which violates the law of nature. The positive function of the individual unconscious is to prevent man's mental development from becoming warped and distorted. It is a persistent energy that strives for normal expression and if repressed, if the vital energy

is impeded, then harmony in the psychic life is impossible. The collective unconscious is distinguished by its constitution of inherited patterns of neural structure, conforming to the "archaic myth phantasy." It is this collective unconscious that predisposes an individual to obsolete ways of thinking, prompts "primordial images" to appear in dreams, bringing on experiences not unlike those of primitive peoples.

JUNG'S PSYCHOLOGICAL TYPES

Jung's contribution to psychology is contained in his description of human types, presented in his volume: *Psychological Types* (1923), and popularly known as extroversion-introversion. We have presented an analysis in the chapter on "Kinds of Personality" (see pages 245-247). No other classification of people has aroused more interest, provoked more research and controversy than this investigation of objective and subjective thinking. To understand the types is to understand his system of thought.

Normal extroverts are legion. They are found everywhere—Aristotle with his love of nature; Darwin pursuing his objective science; Andrew Carnegie transforming finance; they reside in politics, social welfare, religion. Introverts, with an introspective monastic mind are discovered among the poets, mystics, philosophers, scientists, and general public. Wordsworth, Francis of Assisi, Bergson, Edison, have been placed in this category, if pure types are possible. But they are not in the final evaluation except among the abnormal. Actually human life tends to ambiversion or the balancing of these extremes, with a strong predisposition toward one or the other.

Despite these antitheses and opposites Jung's description of types is not an isolated attempt to classify men and women. As Müller-Freienfels¹ has pointed out there is a strong correspondence between Jung's extroverts and Kretschmer's cyclothymics, and between the introverts and the schizothymics, with obvious differences in details. He continues that Jung indicates a resemblance of types with "Schiller's antithesis between naïve and sentimental poets, Nietzsche's contradistinction between the Apollonian and Dionysian, James's religious types, and others."

¹ Richard Müller-Freienfels, *The Evolution of Modern Psychology*. Trans. by W. Beran Wolfe, Yale University Press, 1935, p. 387.

ORIENTATION

Psychology and Public Health.

1. What can psychology offer the nurse in understanding patients?
2. What is the concern of psychology concerning alcohol, drugs, and tobacco?
3. What has psychology to say about clothing?
4. Psychological research concerning sleep.
5. Psychology and the problem of age.

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Psychology and Public Health

Further to illustrate the clinical method in psychology, which really means investigations conducted within the "laboratory of human life," a few topics may be cited, and a few references given, to show how psychological knowledge becomes practical as well as informative. These illustrations will be introduced by a general question followed by brief answers.

WHAT CAN PSYCHOLOGY OFFER THE NURSE IN UNDERSTANDING THE PATIENT?

Emphasis on the Individual. Modern psychology, viewing the individual as a whole—as a total organism, indicates that both the physician and the nurse are dealing with an individual who is sick. The physician and nurse are not only treating a disease but dealing with a sick individual. Sickness, besides being an accumulation of clinical symptoms, is a pattern of behavior characteristic of the individual in accident, in disease, and age. Patients are individuals, varying in their emotional and affective life, in their intelligence, in their achievements and behaviors. One patient may respond with keen and alert ability, another may not behave intelligently because he does not possess the same mental stock-in-trade, and such differences must be respected. The nurse, like the physician, must seek to discern quickly what kind of person is her patient, and act accordingly and sympathetically. She must offer professional contacts that befit the specific individual and work with the tides of nature; to do otherwise is always a disadvantage and may be dangerous.

Knowing the psychological nature of the patient is an indispensable therapeutic aid. It will help to combat the complaining tendencies that easily and frequently arise in the sick. The bedside

manner of the nurse, her qualities of sympathy, gentleness, kindness, and self-confidence should therefore take into consideration the totality of a patient's nature and his environmental experience, as far as this knowledge can be obtained.

Allaying Fears. Psychology joins with every other science that seeks to uproot superstition and erroneous ideas. Many patients are afraid, fears hold them in suspense, disease baffles them, frightens them. Applied psychology should allay fears, correct faulty attitudes, and check ignorant beliefs. If two indispensables must be stated the first would be to give a complete picture of the nature of the patient, and the second to educate him in the faith of the arts and skills of healing. For a patient to disbelieve in the curative means established by medical science for his recovery is poor psychology. If he does not have the urge or better "the will to live" it must be cultivated. This positive attitude toward recovery is a good half of the curative process, for the best physician and the best nurse depend upon the patient for essential cooperation in carrying out the processes of treatment and hence proper attitudes must be built. Here the nurse can employ her knowledge of learning methods to advantage. She can instruct the patient, creating proper attitudes of mind, employing as necessary the techniques of trial and success, remembering, and reasoning, each in its own way, and to the patient's advantage.

WHAT HAS PSYCHOLOGY DISCOVERED CONCERNING ALCOHOL, DRUGS, AND TOBACCO?

Psychology and medicine agree in specifying the ill-effects of certain drugs on the individual. The matter is of deep concern to the psychologist because of his interest in the nervous system of man and its relation to mental life. The nervous system is generally harmfully affected by the use of drugs, narcotics, and similar substances. Important psychological studies have been made on alcohol, tobacco, and drug addiction.

Alcohol. The effect of alcohol on mental life cannot be questioned. Every phase of human efficiency is reduced by its use, particularly in the heavy habitual drinker. The most significant psychological reaction of alcohol on human life is its depressing effect. H. L.

Hollingworth's work¹ confirms the early and famous studies by Dodge and Benedict that in motor and mental efficiency alcohol is a depressant rather than a stimulant. It lowers the active intelligence, generally decreases the powers of memory, and interferes with motor efficiency.

Hollingworth found that consumption of alcohol produced a marked decrease of steadiness, ranging from 68 per cent loss after three to four bottles of beer to practically total loss after six to nine bottles of beer. Recovery was relatively slow.

It has been asserted that the excessive use of alcohol accounts for seventy-five per cent of all crimes and a great proportion of mental disorders. It is responsible for considerable poverty, sexual excesses, venereal disease, the break-up of family relations, and suicide. Actually it is a medical problem and really belongs to the domain of the physician. Abnormal drinkers are true psychiatric cases. Even primary addiction to the use of alcohol is *prima-facie* evidence of psychopathology. Among addicts there is a substantial ratio of psychopathic personalities.

From the standpoint of the mild drinker it is often argued that the use of alcohol gives a definite psychological escape, a comfort and a joy that is hard to secure by other means. It is then that confusion arises from its use. The well-integrated individual may use it moderately and with control. But even so, if it is a substitute for effort so commonly demanded in everyday life, for the required skill in meeting everyday problems, then its action on personality is open to serious question. The discouraged man needs to find other means of reconditioning his baffled personality, his inner psychological conflicts need reeducational therapies and often the hospital or other agencies are his only help.

Drug Addiction. Considerable psychological study has been done on drug addiction, supplementing studies in physiology, pharmacology, and medicine. Carl and Turner² carried on an interesting inves-

¹ H. L. Hollingworth, "The Influence of Alcohol," *Journal of Abnormal and Social Psychology*, 18:204-237, 311-323, 1923. Raymond Dodge and E. G. Benedict, *Psychological Effects of Alcohol*, Carnegie Institution of Washington, Publication No. 232, Washington, D. C., 1915.

² C. P. Carl and W. D. Turner, "The Effects of Benzedrine Sulphate on Performance in a Comprehensive Psychometric Examination," *Journal of Psychology*, 8:165-216, 1939.

tigation of the effects of benzedrine sulphate in a comprehensive psychometric examination. They used 166 subjects with a control group. The control group were given lactose instead of the drug. Results showed that at the end of a four-hour test the benzedrine subjects indicated higher efficiency and less fatigue than the control group given lactose. This apparent increase in the ability to think and remember, the authors attribute to a more generally affective or emotional attitude which favored performance in tasks calling for persistency and quickness. This experiment seems to indicate that certain drugs, unlike alcohol, are stimulants lasting several hours. The stimulant increases the general level of vigor in the manipulation of various tasks.

Tea and coffee are stimulants. Research shows no serious effects from their moderate use. Taken too late at night they may interfere with sleep. Their overuse may produce nervousness and in some cases insomnia, particularly in older people.

Similarities have been noted between drug addicts and chronic alcoholics. Both resort to drugs or alcohol to escape the realities of life and other forms of psychological disturbances, such as personal inadequacies and social maladjustments. A narcotic drug addict is a psychologically ill person because of his incessant craving and use of damaging stimulants. His behavior patterns and personality are seriously affected, especially so when his addiction is well known, and particularly when he is treated as a criminal and committed to prison. The drug addict is clearly a case of intoxication.

E. H. Kitching* has sketched the psychological symptoms of bromide intoxication. In the early stages there is a tendency to confuse words and the objects to which they refer. As intoxication progresses, perceptual defects proceed to memory confusions. Victims are unable to identify people because of a general clouding of consciousness. Motor control is seriously impeded and soon lost. General depression covers the individual's outlook on life. Visual hallucinations frequently occur, and varied paranoid ideas color the behavior and degenerate the personality.

Three groups of psychological investigations of drug addicts may

* E. H. Kitching, "Mental Symptoms in Bromide Intoxication," *British Medical Journal*, 1942, Part I, 754-757, 1942.

be mentioned to supplement the psychological studies cited, and to show further the clinical aspects:

"Methods for Investigating the Effect of Drugs on Psychological Function," by M. G. Gray and E. B. Trowbridge. (Reported in the *Psychological Record*, 5: 127-148, 1942.) This study presents a battery of tests for the evaluation of drug treatment in its effect on the patient as a whole. The tests include steadiness, strength of grip, tapping, and reaction time phenomena.

"The Effects of Bromides on Certain Psychological Test Performances," by E. M. Jellinek and M. Bolles. (Reported in the *Journal of Psychology*, 14: 277-293, 1942.) In this study seventy-five persons were given an assortment of psychological tests at the beginning and at the end of three weeks of sodium bromide dosage. Twenty-five controls were given the same test and retest after three weeks. The controls showed slight improvement on all tests, and significantly for cancellation and opposites tests. The bromide group showed improvement of the opposites, Porteus maze, and orientation tests. Their retest showed a decline on the recognition test, but remained unchanged on the remaining tests. The study indicates that the main effect of bromide was evidence of sedation in the psychological functions measured.

"Psychological Aspects of Sodium Bromide Medication," by L. S. Trowbridge and M. Moore. (Reported in the *Psychological Record*, 5: 151-156, 1942.) This study critically sums up previous investigations of the psychological effects of sodium bromide.

Tobacco. Studies in the natural sciences on smoking have included many topics, such as suggestibilities, metabolism, respiration, and circulation. In psychology a good experiment was made by E. Jacobson, on "Muscular Tension and the Smoking of Cigarettes." (Published in the *American Journal of Psychology*, 56: 559-574, 1943.) It was designed to determine the effect of smoking on muscular tonus, and elaborate myovoltmeters were used. Sessions for the investigation consisted of three periods—pre, middle, and post periods, with no smoking being permitted on control days. In some subjects there was change in muscular tension, in some there was an increase, and in others a decrease. It was concluded that smoking had no marked effect on muscular tension under the conditions of the experiment.

An interesting study on smoking was done by C. L. Hull who de-

vised an ingenious apparatus. He constructed a control pipe which resembled the everyday tobacco pipe, except that it was electrically heated. The subjects were blindfolded, nine of them being non-smokers and ten habitual smokers. On certain days the everyday tobacco pipe was used, and on other days the control pipe, through which only warm air was drawn. It is reported that the subjects could not tell the difference between the two kinds of smoking, that is, between the warm air and the actual tobacco. So far as the reactions from tobacco were concerned the following experimental facts were noted: increase of heartbeat and tremor, and slight slowing of speed in adding numbers, but there was no significant effect noted on the rate of learning.

WHAT HAS PSYCHOLOGY TO SAY ABOUT CLOTHING?

Psychological efficiency draws heavily from the temperatures of air that surround the body, and clothing is a vital factor in this process. Besides being a means of adornment, decoration, and protection, clothing regulates skin temperatures which make their contribution to personal effectiveness. Clothing which fails to permit adequate circulation of the air to the skin, due to improper dressing, is comparable to breathing stagnant air. To this extent women dress far more healthfully than men. Their clothing is much lighter in weight and looser fitting than men's apparel. Some articles of clothing impede health because they prevent adequate circulation of both air for body temperature and blood circulation.

A classic experiment on this problem was done by E. L. Thorndike, W. A. McCall, and J. C. Chapman, entitled *Ventilation in Relation to Mental Work*. (Published by Teachers College, Columbia University Press, 1916.) It is known as the publication of the New York State Ventilation Commission. The subjects in the experiment breathed air through tubes as the air about their bodies was regulated for quality. When the air about their bodies was bad, the subjects showed distress although they were breathing good air through the mouth tubes. The study showed that the temperature and humidity of the air surrounding the body produced relatively greater ease and efficiency than the external air, so far as the psychological consequences are concerned. The temperature of the body surface is there-

fore most important. Circulation of air to the skin is likewise important. Tight clothing, and clothing textures which fail to regulate body heat and perspiration, creates a condition similar to stagnant air in an unventilated room.

WHAT HAS PSYCHOLOGY TO SAY ABOUT SLEEP?

In both health and sickness sleep is a vital response because it is an important need of the body. It is difficult to specify what receptors are active when we feel sleepy, and what effectors send us to sleep. Sleep appears to be a conditioned response involving many receptors reenforced by chemical conditions within the body, and the general relaxation of the striped muscles. Energy-producing materials are lessened, waste products of metabolism are accumulated, and the body is in need of repair. Waste and repair factors differ in individuals, with the kind and amount of work done, hence some people need more sleep (and rest) than others, and some require less than the average.

Sleep and sleep habits have been subjected to highly specialized psychological study. H. M. Johnson⁴ has presented important conclusions from many studies. He used specially constructed beds balanced in such a way that any movement or vibration of the sleeper was recorded on a kymograph, coincidentally causing a camera to take pictures of the sleeper. His conclusions showed that normal sleep permitted postures to be changed at intervals of from five to twenty minutes. It was observed that the duration of the resting postures varies with age. Children two to four years old are usually more active in sleep than are older persons, who have an average motionless period of 7.4 minutes. Middle-aged men average motionless periods of nine minutes. College men remain still for longer periods than any group studied, namely, 12.8 minutes.

A physiological study by Kleitman, Cooperman, and Mullin,⁵ following methods similar to Johnson, obtained records of normal sleepers and found that they make from thirty to sixty shifts of

⁴ See: *Proceedings Ninth International Congress of Psychology*, 1929, pp. 238-239, "Rhythms and Patterns of Nocturnal Motility."

⁵ "Studies on the Physiology of Sleep. IX. Motility and Body Temperature During Sleep," *American Journal of Physiology*, 1933, 105, pp. 574-584.

position per night, with some thirty seconds of activity per hour in units of five to ten seconds. This investigation confirms the general conclusions of Johnson's psychological work.

Observations have been made on the time it takes to go to sleep. Young children require an average of 36 minutes; unselected college students take 13 minutes, middle-aged men 15 minutes, and the wives of middle-aged men 13 minutes.

Frequent change of sleeping posture seems to result in efficient sleep, although one is not conscious of the change. In the early hours of sleep there is less movement than in later hours but this does not mean that sleep is necessarily more restful at that time.

In addition to the two selected studies mentioned, the following works on this important subject of sleep, and its correlate rest, should be read by all students of public health:

On the increase of blood in the cerebral vessels and probable repair of brain tissue: J. F. Shepard, *The Circulation and Sleep*, Macmillan Company, New York, 1914.

On sleep and rest: E. Jacobson, *Progressive Relaxation*, University of Chicago Press, Chicago, 1929.

On sleep and recovery: N. Kleitman, *Sleep and Wakefulness*, University of Chicago Press, Chicago, 1939.

PSYCHOLOGY AND AGE

Psychologists, along with other scientists, have long been interested in the human life-cycle. Stanley Hall contributed his two large volumes entitled *Adolescence*, in 1904 and this study inaugurated the beginning of age-studies. Childhood was the next venture with many investigations on child-growth and development. Many texts have been written on this topic and are commonly called "child psychology," and a vast literature has developed. Within relatively recent years the problem of adulthood has received increasing interest, and more recently the problem of aging, or late maturity and senescence.

Amongst the many recent psychological studies of age are investigations concerning age and intelligence, age and language ability, age and memory, age aversions, age and speech, age and skin sensi-

tivity, aptitudes for age levels, age and accidents, age and military fitness, deterioration in old age.

It is commonly observed that advancing age brings a slowing down of bodily processes; it brings anatomic changes affecting human functioning. Hearing, seeing, muscular activities are subject to diminishing efficiency as age rolls on, yet, fundamental personality traits, such as emotional expressions, self-sufficiency, and similar behaviors do not change to any marked extent. As man grows older it is natural that his motor efficiency—strength and agility, should gradually decrease. But these changes do not necessarily carry with them serious maladjustments. On the contrary, one may be more careful, more painstaking, because the human habit-patterns are deeply rooted and well-established. New learning will combat these well-learned patterns, and although mature persons often meet with difficulties, learning is interfered with only by lessening of the actual physical decrement.

Is Learning Confined to Childhood and Youth? E. L. Thorndike is authority for the contention that middle-aged people can learn intellectual tasks as well as can younger people. He measured three age groups, 20 to 24 years, 25 to 34 years, and 35 or over, in a variety of learning functions. These functions included practice in drawing lines of given lengths with closed eyes and a minimum of guidance, to the learning of an artificial language. His findings are published in his book entitled: *Adult Learning*.

It is obviously harder for human beings to change their habits as life grows older. Cultural patterns are determined by patterns of living, and habits have become deep and well-set. Preferences, and probably biases may impede the acquisition of new ways of thinking and doing in adults, as distinguished from children and youth. These adult traits often induce critical reactions and sometimes obstinacies which prevent the effort to acquire new modes of response. Yet, in the matter of distinction, it has been noted again and again that eminent persons have often done their outstanding work between forty-five and fifty, and there are others whose best work has been done in even later years. A recent tendency in psychological groups is to minimize age and to stress emotional and learning values. When these are recognized then learning never ends.

Important Names Used in This Book

- Adler, Alfred** (1870-1937). Austrian psychoanalyst. Believed that behavior is determined by the craving for power. Frustration of this drive leads to inferiority, hence the phrase "inferiority complex." His theory is well described in *The Practice and Theory of Individual Psychology* (1924).
- Anselm** (1033-1109). Abbot of Bec, later Archbishop of Canterbury. Founder of Scholasticism in the West. Sought to rationalize faith and Christian dogma.
- Aristotle** (384-322 B.C.). Greek philosopher of greatest distinction. Wrote first treatise on psychology. Introduced the theory that psyche (soul) is the principle of life.
- Bacon, Francis** (1561-1626). English statesman-philosopher, the great master of inductive logic.
- Binet, Alfred** (1857-1911). French psychologist and educator, developed (1905) with T. Simon the first age-scale type of intelligence. Previous to his work on intelligence investigated hypnosis and pathological phenomena which made him the original French experimental psychologist.
- Cannon, W. B.** (1871-). American physiologist (Harvard). Investigated the physical basis of the emotions, modifying the James-Lange theory by referring emotions to the thalamus, adding the importance of adrenal gland secretion in emotional behavior.
- Copernicus, Nicolas** (1473-1543). Founder of modern astronomy developing the dogma that the sun is the center and that the earth and plants revolve around it. Influenced the thinking of Kepler, Galileo, Newton.
- Dashiell, J. F.** (1888-). American psychologist. Author of *Fundamentals of Objective Psychology* (1928), *Fundamentals of General Psychology* (1937).
- Darwin, Charles** (1809-1882). Author of the doctrine of natural selection or the survival of the fittest. His *Origin of Species* (1859) is usually regarded as the equivalent of the doctrine of evolution.
- Descartes, René** (1596-1650). Epistemologist (nature and validity of knowledge), and metaphysical dualist (nature and existence of reality). Famous for his *Discours de la methode* (1637), and his maxim *Cogito ergo sum*.
- Dewey, John** (1859-). American instrumentalist and epistemologist (philosopher). An originator of Functional Psychology. His studies on methods of thinking are contained in his book *How We Think* (1910).
- Dunlap, Knight** (1875-). Experimental and comparative psychologist emphasizing reactionism. Author of *Elements of Psychology* (1936).
- Duns Scotus** (d. 1308). Johannes Duns Scotus. A later Scholastic, radical, nominalist, Franciscan monk in England, who made his philosophy a distinct science.
- Ebbinghaus, Herman** (1850-1909). German psychologist. First psycholo-

358 Important Names Used in This Book

gist to study memory (retention) experimentally. Used nonsense syllables. First psychologist to produce a retention curve.

Freud, Sigmund (1856-1939). Famous Viennese physician. Founder of psychoanalysis. Freudian theory assumes that memories persist in the unconscious and affect later behavior without the individual's knowledge of them. Freud sought to discover their nature by skillful questioning benefiting the mental health of the individual (patient). He used the unconscious to explain dreams and common mistakes maintaining hidden complexes are sexual in origin (libidinous).

Galileo (1564-1641). Italian astronomer and physicist born at Pisa. Enunciated the law of vibrations, invented the telescope and with it discovered four satellites of Jupiter.

Galton, Sir Francis (1822-1911). English man of letters and science. Initiated the modern eugenics movement, began the use of statistics in psychology, interested in heredity and the psychology of individual differences.

Haeckel, Ernst Heinrich (1834-1919). German biologist. Asserted in 1877 that the cell is the basis of psychic life. Professor of zoology at Jena. First naturalist to draw genealogical trees indicating the descent of animals.

Hall, G. Stanley (1846-1924). First Ph.D. (Harvard) in psychology in the United States. Student of Wundt, James. Founded first psychological laboratory in the United States (Johns Hopkins) and first psychological journal, *The American Journal of Psychology*. Developed questionnaire method,

became famous for genetic studies of childhood and adolescence. Wrote voluminously. *Adolescence*, 2 vols. (1904), etc.

Helmholtz, Herman von (1821-1894). German physiologist and physicist. Contributed to early physiological psychology. Measured speed of nerve impulses and became authority on theories of color and space perception and resonance theory of audition.

Henning, Hans (1885-). German physiologist who investigated the sense modalities of smell and taste, developing smell prism and taste tetrahedron.

Hering, Ewald (1834-1918). German physiologist. Developed theory of color vision with four primary colors opposing Helmholtz.

Hippocrates (5th Century B.C.). Progenitor of medicine, usually credited with developing the *Medical Oath*. Developed the personality theory of bodily humors—yellow bile, black bile, phlegm, and blood. Dominating characteristic gave phlegmatic, melancholic, sanguine, choleric personality types.

Hobbes, Thomas (1588-1679). English materialistic philosopher. Maintained mind is a brain substance, images and ideas motions in the brain.

Huxley, Thomas Henry (1825-1895). English man of science. Strenuous advocate of evolution. Hunterian professor at the Royal College of Surgeons.

James, William (1842-1910). American physiologist, psychologist, philosopher. Pioneered experimental and general psychology in the United States. Famous for James-Lange

- theory of emotions. His natural approach to psychology led to functionalism in psychology and instrumentalism in philosophy.
- Jung, Carl Gustav** (1875-). Swiss psychiatrist. Stresses the role of racial memories as determiners of conduct useful in diagnosing mental disturbances. Analyzes by method of free association and content of complexes, classifies personality into two main groups—extroversion, introversion.
- Kant, Immanuel** (1724-1804). Eminent German metaphysical philosopher whose chief problem was to present a theory of knowledge securing the just claims of reason, investigating the possibility of its sources, extent, and boundaries.
- Köhler, Wolfgang** (1887-). Leader of Gestalt psychologists, interested in experimentation on intelligence, space perception with apes. Author of *The Mentality of Apes* (1925) and *Gestalt Psychology* (1929).
- Kraepelin, Emil** (1856-1927). German physician who approached mental disease from experimental psychology. Classified the psychoses, investigated influence of fatigue, work, drugs, etc., on human behavior.
- Kretschmer, Ernst** (1888-). German psychiatrist emphasizing relation between body measurements and functional psychoses. Insisted normal human beings may be classified similarly showing types of insanity should they become sick. Divides men into schizothymes resembling schizophrenics in behavior and body builds, and cyclothymes who resemble the circular insane types. Author of *Physique and Character* (1925) and *Psychology of Men of Genius* (1931).
- Lange, Carl** (1834-1900). Danish physician. Published a treatise on emotions (1885) similar to James (1884), unaware of the theory of William James. Lange placed more emphasis on the respiratory and circulatory systems than did James.
- La Place, Pierre Simon, Marquis de** (1749-1829). Famous French • mathematician and astronomer.
- Locke, John** (1632-1704). English empirical dualist in epistemology and metaphysics. His famous *Essay On Human Understanding* maintains ideas are not innate. First sensationalist—that sensation is the origin of ideas, and reflection consists of perception, thinking, reasoning. Insisted that all knowledge is derived through the senses. Mind at birth he considered a *tabula rasa* impressed by on-going senses.
- Lyell, Sir Charles** (1797-1875). Scotch geologist. Published famous *Principles of Geology* (1830), and later other famous geological works.
- McDougall, William** (1871-1938). British psychologist, later active in Harvard and Duke Universities. Advanced the hormic view—purposive psychology. Wrote *Body and Mind* (1911), *An Introduction to Social Psychology* (1908), etc.
- Meumann, Ernst** (1862-1915). Early German investigator of learning and experimental education. Author of *Psychology of Learning* (1913).
- Müller, Johannes** (1801-1858). German physiologist who advanced knowledge of the nervous system by experimentation.

- Nietzsche, Friedrich Wilhelm** (1844-1900). German philosopher and philologist. He is generally identified with the doctrine of the glorification of power. He believed that *The Will to Power* was the basic motivation of life.
- Pavlov, Ivan P.** (1849-1936). Russian physiologist, developed theory of the conditioned response as an objective approach to learning in animals and man. Author of *Conditioned Reflexes* (1927). [Eng. trans.]
- Pearson, Karl** (1857-1936). English mathematician and statistician who worked with Galton, developed the method of correlation used in experimental psychology.
- Purkinje, J. E.** (1787-1869). A founder of modern physiology whose work has penetrated nearly all branches of biology.
- Sherrington, Charles S.** (1861-). English physiologist famous for work on structure and function of the nervous system with its concepts of levels of neural action and the synapse. Author of *Integrative Action of the Nervous System* (1906).
- Spencer, Herbert** (1820-1903). Advocate of cosmic evolution and the doctrine of the relativity of knowledge. His scientific philosophy pursues biology, psychology, sociology, ethics.
- Spinoza, Benedict** (1632-1677). Maintained that the universe is one substance. Parallelistic in thinking, believing that the causal succession of physical events is paralleled by a logical succession of ideas.
- Terman, Lewis E.** (1877-). American psychologist, revised Binet-Simon Intelligence Test for American usage. Known for *Genetic Studies of Genius* (1925).
- Thorndike, Edward L.** (1874-). American authority on educational psychology from animal and experimental approach. Formulated laws of learning. Author of many texts.
- Titchener, Edward B.** (1867-1927). English psychologist, student of Wundt. Introduced early introspective (structural) psychology at Cornell. Eminent in early American psychology as experimentalist.
- Vinci, Leonardo da** (1452-1519). One of three great Italians—Michelangelo, the master of power in all the arts; Raphael, the master of beauty and harmony in painting; and Leonardo da Vinci, master of thought and feeling, embodies the Renaissance at its height. Da Vinci one of the keenest scientific minds in history and prophet of the new scientific age.
- Watson, John B.** (1878-). Founder of School of Behaviorism in America (1913). Insisted that objective method by observation is the only psychology. Studied emotional reaction of infants. Author of *Psychology from the Standpoint of a Behaviorist* (1929), etc.
- Wallace, Alfred Russell** (1823-1913). English biologist, famous for *Contributions to the Theory of Natural Selection* (1870). His theory was identical with Darwin and written independently.
- Weber, Ernst H.** (1795-1878). German physiologist formulating the law of "least noticeable differences" between two sensations which he contended is always a constant fraction of the first stimulus value. Important for early work on kinesthetic sensa-

tions and space sensitivity of the skin.

Woodworth, Robert S. (1869-). American psychologist advocating stimulus-response point of view in psychology. Author of *Psychology* in

several editions, *Experimental Psychology* (1938).

Wundt, Wilhelm (1832-1920). Founder of modern experimental psychology when professor of philosophy at Leipzig.

Glossary of Words and Phrases

- Abstraction.** Observation independent of other characteristics involved in the experience of the whole.
- Accommodation.** (In vision) Change in the shape of the lens in focusing different objects in order to secure a clear image.
- Achromatic.** Lacking in color (chroma, hue, saturation).
- Acuity, visual.** The smallest visual angle at which two points in the field of vision can be distinguished. Sense acuity indicates keen ability to distinguish sensory impressions.
- Adaptation.** Process by which the sense mechanism maintains effective behavior. The result of the adaptation process is adjustment.
- Adjustment.** Reception of stimuli and the effective distribution of nerve impulses in the general nervous system. When responses are socially appropriate to stimuli the organism is said to be well-adjusted.
- Adjustors.** Connectors, modifiers, neurons which connect the sensory and motor paths or parts of the sensorimotor arc. Nervous system unit of adjustment whereby the organism is favorably related to the environment.
- Adolescence.** The period between childhood and maturity when reproductive functions mature creating mental and social changes in the individual.
- Aerial perspective.** Distance perception in terms of height of object as in mountain scenery.
- Affect, affective.** The process of feeling aroused by a stimulus or a motive.
- Affective refers to any variety of feeling or emotional experience.
- After-image.** A sensory image continuing after the removal of the stimulus. (In vision it is attributed to persistent retinal action.) See positive and negative after-images.
- Ageusia.** Absence of taste sensitivity.
- Agraphia.** A brain disorder characterized by inability to write or form letters.
- Amnesia.** Partial or complete inability to recall, a memory disturbance.
- Anacusia, anacousia.** Insensitivity to sound, deafness due to neural or central lesion.
- Anaesthesia, anesthesia.** Partial or complete loss of sensitivity to stimuli.
- Anger.** Reactions of the attack or defense type, an emotion.
- Animal psychology.** Scientific investigations of animal behavior for its own sake or comparatively with man, sometimes called *comparative psychology*.
- Anxiety.** A subacute form of fear alternating with hope for the future. Used in connection with nervous disorders.
- Aphasia.** Total or partial loss of the use or understanding of speech or ability to understand words.
- Apraxia.** Inability to manipulate objects due to a brain disorder.
- Association areas.** Any region of the cerebral cortex connecting projection areas with other units in the same area.
- Associationists.** Believers in associationism—that mental bonds relate

two or more ideas or thoughts by similarity, contrast, contiguity.

Associative neurons. Neurons bringing impulses together to form a neural complex, connecting different regions in the same area or hemisphere of the brain.

Attention. The process of selecting and carefully focusing portions of experience making them more vivid.

Auditory sense perception. Understanding, interpreting, giving meaning to sounds heard.

Autonomic nervous system. The self-governing, involuntary, vegetative division of the general nervous system consisting of widely distributed peripheral nerves, ganglia, and plexuses (network of nervous structures outside of the central nervous system). Autonomic system innervates the visceral effectors (smooth muscles and gland cells). It is divided into two divisions: (1) the sympathetic system, and (2) the parasympathetic (craniosacral) divisions.

Axone, axon. The neuron fiber which conducts nerve current away from the cell body of the neuron toward the synapse and dendrites of another neuron.

Behavior. A general term specifying the observable responses of an organism.

Binocular. Referring to both eyes acting together, vision seen by both eyes.

Binocular parallax. Lateral difference of the two eyes indicating inequality of the retinal images.

Bonds, bond. Thorndike's concept assuming a relationship between neural elements which mediate associations processing neural adjustment.

Brightness, visual. Intensity of visual sensation depending upon the amount

of light energy or stimulus reaching the retina.

Central nervous system. Cerebrum, cerebellum, spinal cord exclusive of the peripheral system.

Chromatic. Color reactions.

Ciliary muscles. In the eyes regulating the curvature of the lens.

Clinical psychology. Psychological methods of investigation built on comprehensive diagnosis and analysis, examination of the processes of behavior by actual observation and contact with the individual concerned, and the quest for remedy leading to the adjustment of the individual's difficulty.

Commissural fibers. Neural fibers which connect region in one cerebral hemisphere with corresponding regions in the other hemispheres of the brain.

Compensation. Adjustment to conflicts by disguises. The individual covers his inferiority by emphasizing a more desirable aspect of behavior.

Complementary colors. Colors that fulfil complementary relations, that give gray and off-whites when mixed on a color wheel.

Complex. A group of emotionally toned ideas, normal or abnormal, such as fear, inferiority.

Complex tones, compound tones. Tones analyzable into components by direct experimentation.

Conation. The active phase of willing (volition), desiring, purposing.

Conceptual thinking. Thinking in terms of a concept—a general idea including all that is suggested to the individual by an object, symbol, or situation. Note there are abstract concepts (an idea acquired as a symbol), concrete concepts (ideas of an object that can be perceived), mathematical

- concepts (ideas related to quantitative relationships, computations).
- Conditioned response.** A response aroused by an associated stimulus which brings an originally non-arousable stimulus into similar or related response.
- Conditioning, conditioned stimulus.** An originally ineffective stimulus which when associated by repetition with a previously effective stimulus becomes capable of arousing the same or similar or related response.
- Configuration.** Gestalt psychological term indicating that parts of any mental pattern do not equal the whole because each part influences every other part of experience. The configuration is the whole pattern and is more than the sum of its parts.
- Connectors.** Adjustors, nerve processes connecting receptor with other segments of the reflex or response arc.
- Consciousness.** Awareness of human experience. The states and processes which give the sum total of mental content.
- Convergence, visual.** The fusion of images on the retinas to form oneness. *Neural* convergence, the bringing together of neural impulses into a single nerve function.
- Conversion.** A psychoanalytic term meaning the transformation of a repressed affect into a physical manifestation, such as hysterical blindness, the blindness being a conversion symptom.
- Cortex.** Cerebral cortex—the outer layer of the cerebrum. Outer layer of cerebellum, adrenal gland, etc.
- Corti, organ of.** Structure within the inner ear for initiating auditory response.
- Cranial.** Cranial nerve—arising from brain stem connecting receptors with effectors. Cranial-sacral—parasympathetic parts of the autonomic nervous system.
- Creative, inventive.** Part of the thinking response. The skill in producing new ideas, constructive activity.
- Cutaneous.** Refers to skin sensations.
- Day dreaming.** Phantasy.
- Defense adjustments.** Pseudo-adjustments using *defense mechanisms*—self-protective reactions defending the ego against inferiority, such as rationalization, compensation.
- Degree of illumination.** Relative amount of quantity of light incident to the object.
- Dendrite.** Tree-like terminals of the neuron transmitting impulses through cell body and axon to the synapse. The receiving ends of neurons.
- Depth perception.** Understanding, interpreting distance from man and objects seen.
- Depth psychology.** Psychology of the unconscious.
- Dermis, derma.** The true skin lying beneath the epidermis.
- Diagnosis.** Method of clinical psychology, discovering abilities or disabilities by test and related procedures.
- Discrimination.** Perceiving of differences between two or more objects.
- Disparity of retinal images.** Difference between retinal images when perceiving an object which must be fused to give adjusted vision.
- Dissociated personality.** Inability to coordinate behavior, as in loss of memory, nervous ailments, phobias, etc.
- Drive.** An intraorganic condition within the body, usually strong, sup-

- plying stimulation that demands behavior reactions.
- Dualism.** Mind and body regarded as separate entities.
- Duct.** Channel providing flow of some secretion or liquid.
- Ductless glands.** Endocrines, a class of multicellular glands not provided with ducts for discharging their secretions.
- Duration.** The measured time of an event, such as a sound, a taste, a smell, etc.
- Dynamic psychology.** Relating to objective mental activities interpreting psychology as mental phenomena in the cause and effect relationship.
- Effect, Law of.** Learning is quicker and more adequate when reactions are accompanied or followed by a satisfying experience. Annoyances retard speed of learning.
- Effectors, effector.** A muscle or gland of a responding organ within the reflex arc which receives excitations from the nervous system. Effectors are somatic for muscular skills, and visceral for feelings. Effectors are stimulated by motor nerve excitations.
- Egocentric.** Self-centered.
- Elements.** A constituent part of any phenomenon, mostly of the simplest sort. Used by introspectionists to indicate the fundamental elements—sensations, images, and feelings.
- Emergency theory.** Cannon's theory indicating that strong emotion is the result of interplay of neural impulses between the cerebral cortex and the thalamus.
- Emotion.** A stirred up condition of the organism designated as fear, love, anger, or any composite of the basic feelings.
- Emotional responses.** Emotions characterizing a strong degree of feeling expressed in behavior.
- Empirical, empiricism.** Pertaining to experience by experiment. Following the doctrine that all knowledge (ideas and categories) is the product of sense-experiences, reason contributes nothing to it, all is derived from sensation. Empiricism is opposed to rationalism.
- Empirical science.** Natural science or science by experimentation.
- Endocrines.** Ductless glands forming a specific chemical substance which passes into the circulatory fluid producing physiological effects expressed on the internal organs.
- Enervate.** To lessen energy, mental or physical vigor.
- Enlightenment.** Eighteenth century thinking glorifying knowledge through the sciences and arts, civilization and progress, race and achievements.
- Epidermis.** The epithelial or outer skin surface.
- Epistemology.** The philosophic name given to the branch of science indicating the manner by which man gains knowledge.
- Equilibric.** Balance, posture.
- Erotic.** Relates to sex sensations.
- Escape mechanism.** A flight or avoidance reaction, avoiding the real problem.
- Evolution.** A series of phylogenetic changes in the structure or behavior of organisms accounting for higher forms of life proceeding from lower life-levels.
- Experience.** The integration of psychological phenomena coordinated into a mental image.
- Exteroceptors.** A receptor or sense organ activated by stimulations or

- energies which originate outside the body.
- Extroverts, extroversion, extra-verts.** Individuals with outward interests, interests directed toward social events.
- Extrinsic.** Outward, characterizing the value of data in its relation to other data.
- Fear.** A primary emotion, defensive.
- Feelings.** Affective accompaniments of human experiences characterized as either pleasant or unpleasant.
- Fetish.** Erotic attachment to object worn by another individual, usually opposite sex.
- Frustration.** Thwarting of behavior preventing habits of adjustment.
- Functional deafness.** Malfunctioning of the auditory nerve or cortical centers for audition.
- Function.** The use of a physical structure.
- Functional psychology.** Psychology emphasizing the physiological role in human response regarding them as processes or activities rather than experiences.
- Ganglia, ganglion.** Nerve cells outside the brain and spinal column.
- Generalization.** Formulation of general principles from general idea depicting a class of data.
- General psychology.** Psychology based on general individuals rather than one individual.
- Genetic psychology.** Considers the origin and development of animal and human life. Individual development is called *ontogenetic*, racial development is called *phylogenetic*.
- Gestalt.** A pattern referred to as a configuration. *Gestalt psychology* emphasizes the investigation of total stimulations in behavior. See Köhler.
- Glandular types.** Types of personality following any endocrine emphasis.
- Gray matter.** Cell bodies of nerve cells within cord or brain.
- Gustation.** Taste sense.
- Habit.** Automatic, learned responses easily acquired that become relatively permanent.
- Hallucinations.** Errors of perception. Objects appear to be actual when they are not real. When the error is unrecognized hallucinations become abnormal.
- Hormic psychology, hormic theory.** Purposive psychology, behavior motivated by purposes, urges in quest of goals. McDougall's view.
- Hormones.** Endocrine chemical secretions poured into blood stream essential to physical and mental development.
- Hue.** Color, color tone. A visual impression determined by wave-lengths.
- Human nature.** Constellations, assemblages of common human traits.
- Hyperesthesia.** Excessive skin sensitivity, or special sense sensitivity, auditory, gustatory, muscular, etc.
- Hypergeusia, hypergeusesthesia.** Abnormal acuteness of the sense of taste.
- Hyperkinesis, hyperkinesia.** Abnormal mobility, prodigious activity.
- Hypermnnesia.** Extreme retentiveness of memory.
- Hyperopia, hypermetropia.** Farsightedness. Rays of light fall behind the retina and prevent perfect vision.
- Hypokinesis.** Decreased functional activity, slow in movement.
- Hysteria.** Lack of control over emotions, characterized by dissociations whereby the individual tries to get rid of a conflict by some kind of symptom.

Id. The impersonality of mind consisting of the sum total of instinctive tendencies (Freudian).

Idea. An experience not dependent wholly on sensory stimulation. Represents a previous event or experience.

Idiot. Mentally deficient with IQ below 20, or 25.

Illusion. Misinterpretation or distortion of perceptions. Inaccurate, distorted perception. Object appears to be right when actual physical facts are made to conform.

Image, images. Mental picture, product of a previous sense perception. May represent any sense.

Imagination, imaging, imagining. Product of memories which give new experiences becoming inventive, creative.

Imbecile. Mentally deficient with IQ from 20 to 50.

Imperception. Sensation or stimulus too weak to give perception.

Impulse. Involuntary action within the organism. Neural impulse represents energy within the nervous system, which provokes reaction or response.

Inferiority (complex) feeling. Attitude of inadequacy socially acquired, probably by faulty training.

Inner ear. Labyrinth of the human ear consisting of vestibule (sacculle, utricle), cochlea (basilar membrane, organ of Corti).

Innervation. Efferent nerve supply exciting an effector.

Integration. The organization and coordination of human reactions necessary in the adjustment of behavior.

Integrative nervous action. The coordination of nervous functions giving a basis for adjustive behavior.

Intelligence. Native capacity providing all round ability to learn, to adapt one's capacities to new situations meeting them quickly and successfully.

IQ, Intelligence quotient. Ratio between mental age and chronological age, e.g., MA/CA multiplied by 100 equals the IQ.

Intensity, auditory. Magnitude of tone or noise. Generally applied to magnitude, degree, quantity attributed to any phenomenon.

Interoceptor. Receptor cells activated by internal stimuli. Sense organs operating within the body especially the alimentary canal and other deep-lying tissues.

Intraorganic. Within the organism.

Introspective, introspection. Subjective method of observation, attempting to introspect or inspect mental states or processes. Method of Structuralism, Existential Psychology.

Introvert, introversion. Individuals whose main concern is with themselves rather than the world with its people and social events.

James-Lange Theory. Theory of emotion which contends that the perception of organic changes in the muscles and viscera creates emotional experience. James formulated his theory in 1880, Lange, a Danish physiologist formulated the similar theory in 1881 without knowing of James' presentation.

Judgment. A mode of thinking whereby decisions are reached.

Kinesthetic. Sense or muscle movement, motor sense, important in physical skills.

Labyrinth sensations, Labyrinthine senses. Sense of balance and position.

Learning. Modification of behavior introducing new acquisitions.

Libido. Psychic energy activating the instincts, broadly sex drive (Freudian).

Lobe, brain. Frontal, parietal, occipital, temporal portions of the cerebral cortex.

Local sign. Sensory quality which varies with the locality of the stimulus especially on the skin, serves as a cue for tactual perceptions.

MA, mental age. Age level of performance determined by intelligence tests, comparing performance with the average performance of others of the same chronological age.

Maladjustment. Lack of adaptability in behavior to conditions and surroundings, maladaptation.

Masochists, masochism. Pleasure from physical abuse causing sexual excitement.

Maturation. Growth or ripening or development of a trait. Completing mental and physical growth.

Mechanism. Organism. Comparing the body to a machine. Mechanical psychology is opposed by purposive, hormonal, gestalt psychologies.

Medulla oblongata. Bulb-like prolongation of the spinal cord.

Memory. Conventional term designating the function of recall, reliving past events. *Logical memory* is memory for meaning rather than exact words. *Rote memory* is memory without understanding, the memory of mere words.

Metabolic, metabolism. Energy changes within a living organism. Anabolism = building, catabolism = breaking down.

Midbrain. Mesencephalon. The middle cerebral vesicle of the embryonic

brain from which develop the corpora quadrigemina (the dorsal part of the midbrain) and the two columns which connect the cerebrum and the pons.

Middle ear. Malleus, incus, stapes.

Mind. A general descriptive term indicating the mental activities of man.

Mind-body problem. The attempt to decide whether mind and body are separate entities (dualism); whether mind and body are interdependent one upon the other (interactionism); whether mental and physical aspects of life run parallel (parallelistic monism) considered as corresponding aspects of reality; whether mind and body are declared to be one substance (monism).

Moron. Mental defective with IQ 50 to 70 approximately.

Motivation. An incentive that arouses activity. Sometimes regarded as a drive but actually a conscious experience determining behavior.

Motives. Determiners of conscious response.

Motor area. The region within the frontal lobe of the brain, anterior to the central fissure and functioning in muscular reactions.

Motor learning. The acquisition of motor skills.

Natural science. Sciences dealing with natural objects usually including physics, chemistry, biology. Objective and experimental psychology and their relationships are considered a part of natural science.

Negative after-image. Reversal of original stimulus in the after-image, e.g., black appears as white, color reappears as complementary.

Neural adjustment. The normal continuative functioning of the central

- nervous system. Incoming impulses by reason of their adequate distribution are transformed into effective outgoing impulses contributing to psychological integration (coordinated and controlled behavior).
- Neural arcs, nervous arcs.** Afferent nerves, sense organs, neural center, and efferent nerves coordinated for muscular reaction.
- Neurasthenia.** A chronic state of nervous exhaustion.
- Neuron, neurone.** The physical unit of the nervous system consisting of cell body, axon, and dendrites.
- Neurosis.** A lower form of behavior abnormality, a functional nervous disturbance. Neurotic.
- Noise.** Auditory experience consisting of non-rhythmic sound vibrations.
- Nominalism.** A term used extensively by scholastic philosophers maintaining that Universals or concepts are merely names for certain similar qualities and relations observed in particular things in which real existence inheres.
- Nucleus.** A group of nerve cells within the brain.
- Nystagmus.** Twitching eyes usually caused by labyrinth function in the inner ear.
- Objective method.** Observation of behavior by measuring instruments and tests.
- Olfactory area.** Hippocampus, the in-folded area of the temporal lobe in the brain.
- Organic, organismic.** Behavior from the standpoint of the entire individual rather than by parts.
- Ossicles.** Middle ear, the small bones popularly known as the hammer, stirrup, and anvil.
- Otitis media.** Middle ear deafness.
- Outer ear.** Concha, meatus, tympanum.
- Overcompensate.** Exaggeration of a trait of personality considered socially desirable. Usually used to cover up a personality deficiency.
- Overt responses.** Explicit, unconcealed responses.
- Overtones.** The tone given by vibrating segment of a sounding body with a frequency that is a multiple of the fundamental tone.
- Paramnesia.** Memory defect, events are recalled incorrectly.
- Paranoia, paranoics.** A psychosis marked by delusions.
- Parasympathetic nervous system.** Cranial and sacral parts of the autonomic nervous system. Acts to check the sympathetic system.
- Paresis.** A psychosis resulting from syphilitic infection, marked by delusions.
- Partials, partial tone.** Component frequency of a complex tone.
- Percept.** Consciousness or awareness of the object as it appears in experience.
- Perception.** Understanding, interpretation of sensory reaction, meaningfulness.
- Perception of depth.** Perceiving the solidity of objects and their relative position in space.
- Perceptual motor learning.** Efficient functioning of the sensory and motor nerves and their muscular connections giving rapid reaction to stimuli with a minimum of effort.
- Perceptual responses.** Responses indicating the meanings of sense data.
- Peripheral nervous system.** The systems of spinal and cranial nerves connecting brain and spinal cord with receptors and effector (motor) organs.

Personality. The totality of an individual's traits, measured by tests of emotional stability, emotional maturity, ascendance, submissiveness, etc.

Phantasy, fantasy. Daydreaming, wandering imagination, wishful thinking.

Philosophy. The mother of sciences. Investigates the ultimate nature of knowledge and of existence. Natural philosophy is represented by physics and biology; social philosophy by the social sciences—economics, history, sociology.

Phobia. A morbid, exaggerated fear.

Pitch. Characteristic of tonal sensation differentiating tones as high or low.

Physiological psychology. Stresses the mechanics of structure.

Pituitary gland. Endocrine at base of brain. Anterior lobe promotes physical growth, posterior lobe interferes with physical growth.

Poggendorf illusion. Small angles are overestimated and larger one underestimated.

Point scale. Graphic measurement relating percentiles in a group.

Pons. Pons Varolli, transverse band of decussating fibers encircling the medulla. Contains nuclei for cerebellular activity.

Positive after-image. Visual after effects in which the stimulating hues are retained in their actual color.

Projection. Process of attributing one's desires to others as a defense against acknowledging them as one's own. Used to defend the ego by lessening one's sense of guilt. (Freudian)

Projection area. Sensory and motor areas in the cerebral cortex. Nerve impulses pass over projection fibers from lower brain centers.

Projection fibers. Nerve fibers connecting the receptors (sense organs) and effectors (muscles) with the projection areas.

Proprioceptive impulse. Muscular impulse, impulse arising within muscles, tendons, joints.

Proprioceptors. Receptor in muscles, tendons, joints whose stimuli (changes in tissues) result from the movement of the body giving motor impulses.

Psychasthenia. Janet's term for a neurosis marked by fixed ideas, weak decisions.

Psyche. Principle of life. Soul. Mind.

Psychoanalysis. Depth psychology. Originated by Freud.

Psychological profile. Psychograph. Chart indicating the measurement of individual traits.

Psychometrics. Quantitative measurements of mental phenomena.

Psychoneuroses. Functional disorders less pronounced than the psychoses.

Psychopathic personalities. Individuals with psychopathic instabilities.

Pure tone. Simple tone, relatively simple periodic sound vibrations unanalyzable into parts by direct observation.

Purkinje phenomenon. The greater clearness of light rays of short-wave length in dim light indicates the relative brightness of the colors. As the spectrum is darkened the long wave-end loses its brilliance and darkens more readily than the short wave-end.

Purpose, purposive psychology. Reactions motivated by incentives. A purposeful act aroused within the thinker himself with an end or goal in view.

Quality. Aspect, attribute, characteristic or fundamental dimension of ex-

perience, involving variations in kind but not in degree.

Questionnaire. Systematized questions used for eliciting facts as in personality measurements.

Rating scales. Items arranged to evaluate products for rating, scoring. Several kinds: graphic, man-to-man, numerical, etc.

Rationalization. Finding an excuse for behavior emotionally determined.

Rational psychology. Investigation of mind problems by rational means; a phase of philosophy.

Rationalism. A theory that knowledge is derived from reason and thought rather than sense experience.

Reaction time. Interval between stimulus and response.

Reasoning. Reaching conclusions by thinking, problem-solving.

Recall. Memory. Reviving and restating old experiences.

Receptors. Sense organs. Specialized cells in sensory (afferent) neurons which when adequately stimulated initiates an impulse in the associated afferent nerves. Three kinds of receptors: exteroceptors, proprioceptors, interoceptors.

Recognition. Percept recognized as having been previously experienced.

Reconditioning. Relearning whereby undesired responses are eliminated or controlled by association with pleasant behaviors.

Reflex arc. Reflex circuit, a reaction mechanism of the nervous system consisting of receptors, sensory (afferent) nerves, motor (efferent) nerves, making a reflex circuit.

Reflexes. Simple mechanical responses of an effector unit to a stimulation receptor unit.

Regression. Taking refuge in past childish experiences.

Repress. To force unpleasant images out of consciousness to escape facing a conflict.

Retrograde amnesia. Prevention of recall by physical or mental shock of previous events.

Sacral. Lowest division of the autonomic system.

Saturation. Quality of color free from gray mixture.

Schizoid. Schizophrenic—delusions, dissociated emotions causing mental deterioration.

Scholastic psychology. The philosophy of the Schoolmen—Anselm to William of Occam in the 13th century concerned with the logic of intellect and will.

Senescence. Period of decline of function in mind and body, old age.

Sensation. The immediate conscious result of the stimulation of a sense organ.

Sense activity. Similar to sensibility, activity of sense organs when stimulated.

Sense data. The product of the senses giving basis for sense-perception.

Sense experience. Consciousness derived from the functioning senses.

Sense physiology. The functioning of the organs of sense and their related physiology.

Sensibility. Capacity of the organism to receive stimulation.

Sensing. Direct perception.

Sensory areas. Sense centers in the brain consisting of regions of the cerebral cortex receiving afferent (sensory) paths from the receptor organs.

Sensory mechanism. The machinery of behavior especially the sense or-

- gans or receptors—exteroceptors, proprioceptors, interoceptors, and their contiguous neuromuscular parts.
- Sentiments.** Opinion or thought based on emotional set, an intellectualized emotion.
- Situation.** Internal (organic) and environmental factors at any given moment. A broader term than stimulus but inclusive of the stimulus pattern.
- Social drives.** Drives said to arise from external stimuli arousing strong instinct-like behaviors of a social nature.
- Somatic effectors.** Body effectors, such as striped muscles producing skills.
- Soul. Psyche.** The force controlling man's behavior, the substance accounting for man's mental life.
- Space.** The perception that includes extension, position, and the three dimensions.
- Static sensations.** Sensations which furnish position of body or its parts.
- Stimulus.** An energy or force that causes a receptor to react.
- Stimulus-response theory.** Reactions or responses occurring as a result of excitation of the senses. Excitation of the senses is all-important and all behavior analysis proceeds therefrom.
- Structure, structural psychology.** Introspective psychology, existential, *Titchenerian school*, emphasizing consciousness.
- Sublimation.** Refining an urge by changing an unconscious drive into a conscious activity or thought, making conduct socially approved.
- Superperception.** Highly gifted perception.
- Syllogism.** A type of deductive reasoning discovered by Aristotle. Judgments so related that an inference may be drawn therefrom.
- Symbolization.** Mental factors in dreams, wit, myth, etc. Freudian term.
- Sympathetic nervous system.** Part of the autonomic nervous system lying outside the spinal cord in the abdominal cavity. The thoracic-lumbar regions with peripheral nerve connections. The sympathetic system receives impulses from the spinal cord and transmits them to the viscera, glands, characterizing feelings of unpleasantness.
- Synapse.** Point of contact between neurons combining the end-brush of one with the dendrites of another neuron.
- Thalamus.** Structure base of cerebrum on either side of the third ventricle. Contains the central terminals of the afferent neurons.
- Thinking.** The process of making judgments, relating them in the solution of problems. Correlated with reasoning, judging. Represents the highest intelligent activity of man.
- Timbre.** Characteristic of a complex tone dependent on the relative intensity of the partials or elementary tones.
- Tinnitus aurium.** Ringing, buzzing in the ears.
- Trait.** A psychological characteristic arising from an individual's native endowment.
- Trial and error learning.** Making chance movements until one appears to be successful then repeating such movement until it becomes habitual, learned.
- Unconscious.** Memories that persist without conscious awareness.

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Vallate. Surrounded with an elevation.
Applied to tongue structures.

Visceral. Referring to organs of the abdominal cavity.

Visceral effectors. Smooth muscles producing feelings. Organic senses.

Visual perception. Perception of objects seen.

White matter. Axon bundles in brain and cord, coated with myelin sheath.

Worry. Emotion, form of fear, basic to anxiety.

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